THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LXV.—No. 14 Whole No. 1,113. | NEW YORK, MONDAY, OCTOBER 5, 1896 | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, New York.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES—
Twenty-fourth General Meeting, American Gas Light Association 521
October Meeting, Society of Gas Lighting 522
EDITORIALS—
Briefly Told 522
Varying Phases of the Acetylene Question—The New York "Special" for the St. Louis Meeting—Notes.
*Gas Lighting by Incandescence 523
*Compressed Air as a Hoisting Power in the Foundry by Mr. G. A. True 527
*Pinkney's Apparatus for Producing Gas 529
European Boiler Practices 531
ITEMS OF INTEREST FROM VARIOUS LOCALITIES 532
Annual Meeting Adjourned, Brookline, Mass.—The Quality of Buffalo (N.Y.) Gas—To Test the Validity of an Ordinance, Mt. Vernon, N. Y.—Annual Meeting, Amherst, Mass.—An Excellent Exhibit by the Ottawa (Can.) Company—Glens Falls (N. Y.) Company versus Local Sewer Contractors—Consolidated at Sacramento, Cal.—Death of Mr. H. N. Beach—A Massachusetts Gas Company in Trouble—A Gas Thief Convicted—Public Lighting, Milwaukee, Wis.—A Move by the Queen City Company, Buffalo, N. Y.—Taxing Kentucky Gas Companies—Receiver for the Canisteo (N. Y.) Company—In the Hands of a Receiver, Middletown, Ohio—An Interesting Suit—And Other Items.
CORRESPONDENCE—
Mr. Enright's Experience with Acetylene Gas 533
Consumption of Petroleum for Fuel 534
Another Petroleum Gas Machine 535
Gas Engines for Ships 535
The Market for Gas Securities 535

[OFFICIAL NOTICE.]

Twenty-fourth General Meeting, American Gas Light Association.

OFFICE OF THE SECRETARY,
PROVIDENCE, R. I., Sept. 15, 1896.

There will be a general meeting of the American Gas Light Association held in St. Louis, Mo., on October 27, 28 and 29, 1896.

The meeting will be called to order by the President, C. J. R. Humphreys, of Lawrence, Mass., at 9:30 o'clock, A.M., on Tuesday, October 27, in the meeting hall at the Planters' Hotel, the headquarters, which occupies half a block on Fourth street, between Pine and Chestnut.

The Planters' is one of the very finest hotels in the West, and is conveniently reached by the principal street car lines, and is amply large enough to take care of all who attend the convention. The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in doing so a reply should be requested, for which a self-addressed stamped envelope should be enclosed, as misunderstandings may thereby be averted. The Planters' is conducted on both the American and European plans. On the American plan there will be a few rooms at $3.50, plenty of rooms at $4, with bath, $5; or two adjoining, with bath between, $4.50 each, and up. European plan, $2 and $2.50 and up. Rates are the same for corresponding rooms on all floors above the third. The Southern Hotel is a fine house at Broadway, Fourth and Walnut streets, 2½ blocks from the Planters', and is American plan, $3 to $5 a day. The Lindell is a good house on Washington avenue, between 6th and 7th streets, six blocks from the Planters', and is American plan, $2.50 to $4.50 a day.

The change of date from the third Wednesday of October was made positively necessary by an entirely unforseen occurrence. During the first week of that month St. Louis is filled with visitors to the fall festivities, and this year the second week was chosen for the meetings of two very large associations, the Carriage Makers and the Street Railway people; but as the hotels would be unable to take good care of two such large conventions at the same time, the Street Railway convention was changed to the week of the third Wednesday, and as that convention meant about 3,000 persons in attendance, our members could not have been comfortably housed. The President and Secretary therefore went to St. Louis, and after mature consideration in consultation with the local members, it was fully decided that to hold our meeting on Tuesday, Wednesday and Thursday, October 27, 28 and 29, was the best arrangement that could be made.

The meeting hall will be the Ladies' Ordinary, on the parlor floor of the Planters' Hotel; thus the headquarters and hall will be in the same building.

The roll call will be made by means of the door card system. Each member upon entering the hall for the first time will at the door receive a special card upon which he will find his name, address, etc., as it appears on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of application for membership accompanies this circular. More can be obtained of the Secretary.

Remember, all applications must be in the Secretary's hands by October 17, at the very latest, otherwise they will not be acted upon at this meeting.

The list of papers to be read at the meeting is as follows:

"A Discussion of the Methods Employed in Introducing Gas Stoves," by Charles H. Nettleton, Derby, Conn.

"Some Experiments on Internal Illumination," by Carter H. Page, Jr., Philadelphia, Pa.

"Inclined Retorts up to Date," by Frederick Egner, Norfolk, Va.

"A Modern Retort House," by Wm. A. Miller, Cincinnati, O.

"The Separation of Water Gas Tar," by Alten S. Miller, Long Island City, N. Y.

In addition to the above there will be several topics brought in for discussion by short written introductions.

All questions for the Question Box should be sent in to the Secretary as soon as possible in order that they may be printed in the next circular before the meeting, thereby insuring their discussion.

During the days of the meeting all announcements will be posted on the bulletin board in the meeting room. All members are warned to take notice thereof accordingly.

All members attending the meeting are particularly requested to wear their membership badges in plain sight, thereby greatly aiding the officers and the Local Committee in their work, by affording a ready means of recognition.

In order that the Year Book containing the report of the St. Louis meeting may be published and issued to the members immediately after the meeting, notice is hereby given that if any of the speakers at that

meeting desire to correct their remarks in discussions before they are printed, they will be given an opportunity before leaving St. Louis, but *not* after. The stenographer will have typewritten copy of the principal discussions prepared at the headquarters between the sessions of the meetings, and all those who desire to correct their remarks *must* notify the Secretary at the close of the session at which such remarks are made, as all the report will be turned in to the printer immediately after the adjournment of the meeting.

Special rates for transportation have been granted (viz., full fare going and one-third fare returning by the same route) by the several Passenger Associations named and under the conditions noted.

The Central Passenger Committee, covering the following grounds: Bounded on the east by Pittsburgh, Salamanca, Buffalo and Toronto; on the north by the line of and including points on the Grand Trunk Railway from Toronto to Port Huron, thence via Lakes Huron and Michigan to the north line of Cook county, Ills.; on the west by the west line of Cook county and the Illinois and Mississippi rivers, to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis; and on the south by the Ohio river, including points on either side of that river.

The Southern States Passenger Association, covering the territory south and west of the Virginias and south and east of the Ohio and Mississippi rivers.

The Trunk Line Passenger Committee, covering territory west of New England and east of Niagara Falls, Buffalo and Salamanca, N. Y.; Pittsburgh, Pa.; Bellaire, O.; Wheeling, Parkersburg and Charleston, W. Va.

The New England Passenger Association, covering nearly all of the lines in the New England States.

The Western Passenger Association, from points in Eastern Committee and Trans-Missouri Committee Territories.

The following extracts from the regulations of the railroads are cited for the information of the members. The special rates are granted subject to these regulations:

1. The reduction is conditional on there being an attendance at the meeting of not less than 100 persons holding certificates.

2. Each person to obtain the excursion rate must purchase a first-class ticket (either limited or unlimited) to the place of meeting, for which he will pay regular fare, and upon request the ticket agent will issue a printed certificate of purchase of the standard form. Agents at all important stations are supplied with certificates.

3. If through tickets cannot be procured at the starting point, purchase short-trip ticket to the most convenient point where such through tickets can be obtained, and there purchase through to place of meeting, requesting a certificate from the ticket agent at the point where each purchase is made.

4. Tickets for the return journey will be sold by the ticket agent at the place of meeting at one-third the highest limited fare, only to those holding certificates signed by the ticket agent at point where through ticket to place of meeting was purchased, and countersigned by signature written in ink by the Secretary of the Association, certifying that the holder has been in regular attendance at the meeting.

5. No reduction of fare will be made on the return passage if the going ticket is purchased more than three days before the opening date of the meeting; except that when meetings are held at distant points to which the authorized limit is greater than three days, tickets may be purchased before the meeting in accordance with the limits shown in regular tariffs.

6. Certificates are not transferable, and return tickets secured upon certificates are not transferable. The transfer of any such is liable to prevent the securing of reduced rates for future meetings.

7. The certificate of agent at starting point, duly endorsed by Secretary of Association, must be presented to ticket agent at place of meeting, within three days (Sunday not reckoned except by Southern Passenger Association) after adjournment of meeting. The return ticket will be for the line or lines covered by the going ticket.

8. No refund of fare will be made on account of any person failing to obtain a certificate.

Special.—Those desiring to join the New England party should communicate at once with C. J. R. Humphreys, Lawrence, Mass. Those wishing to join the New York party should communicate with C. E. Sanderson, 32 Pine street, New York city. Be sure to obtain your railroad certificate when buying your ticket for St. Louis. Apply for ticket and certificate at least 30 minutes before train time. Each person must sign his own certificate at time of purchasing ticket for St. Louis. Be sure to have the Secretary endorse your certificate at St. Louis as soon as you get there. Apply for return ticket at least 30 minutes before train time, and have your certificate with you. Any person, ladies included, attending the meeting, is entitled to the reduced rate from the territories named.

Members will please hand their certificates to the Secretary, or his Clerk, upon arrival at place of meeting. If there are one hundred members present, holding certificates, each certificate will then be properly endorsed and handed back to owner before adjournment.

Extracts from the Constitution.

Sec. 12. Application for active membership or for associate membership, or for transfer from associate to active membership, must be received by the Secretary at least 10 days prior to the meeting at which the application is acted on.

51. No member who owes two years' dues shall be entitled to vote, or to participate in the deliberations of the Association, or to receive a copy of the proceedings.

52. Any member whose dues shall remain unpaid for a term of three years may be dropped from the roll of membership by a vote of the Council.

A. B. Slater, Jr., Secretary.

[Official Notice.]

October Meeting, Society of Gas Lighting.

Office of the Secretary, Oct. 1, 1896.

The October meeting of the Society of Gas Lighting will be held in "The Arena," No. 39 West 31st street, at 3 P.M. of the 8th inst.

Fred. S. Benson, Secretary.

BRIEFLY TOLD.

Varying Phases of the Acetylene Question.—Almost everyone connected in a practical way with gas manufacture has determined that acetylene gas, produced by the decomposition of calcic carbide, as the latter material is now gotten ready for marketing, is out of the question, either for use by itself or as an enricher for coal or water gas. The reason for this opinion or belief is in the fact that the cost of the carbide is so great as to preclude its use; for neither in this country nor in Europe can it be obtained in quantities at a rate lower than $100 per ton. At the Neuhausen works, in Switzerland, the motor power of which is hydraulic, the output of carbide is disposed of at $101 per ton, although the proprietors of that plant, through their recently having acquired additional water powers, with the purpose of going on with the manufacture on a larger scale, hold out the hope "that the present price ($101) may be reduced somewhat in the near future." On the other hand, the general public still clings to the delusion that acetylene gas, measure for measure of illumination, can readily compete with ordinary illuminating gas, and this belief renders it possible for "promoters" to still float companies, the main stock in trade of which is the ownership of rights in "certain improved methods for the manufacture and distribution of acetylene gas." On page 534 of this issue will be found an interesting recital of an experience recently had by Mr. J. H. Enright, Superintendent of the Meridian (Miss.) Gas Light Company, in connection with an attempt to dispose of "acetylene rights" for that State; and as Mr. Enright tells a very plain, matter-of fact story, we propose to let his lines speak for themselves, although we might add that they appear very convincing. A third class of acetylene dabblers, however, exists; and these might be dangerous, were it not for the fact that their arguments, while undoubtedly honest, are altogether open to disproof. For instance, in the current issue of that entirely reputable publication, Appleton's *Popular Science Monthly*, is an article entitled "Acetylene, the New Illuminant," by Mr. V. J. Youmans. In the main, so far as the recital of the history and chemistry of the subject is concerned, the article is meritorious; but in his summing up, the author goes badly astray; for he says: "On the whole, then, it may be said that acetylene promises to be an important rival of the present methods of illumination, and deserves the careful examination of both consumer and manufacturer of light-givers." Were the material even obtainable at the price per ton ($32.76) at which he puts it, there might be *something* in it as an enricher; but the plain fact is that just now it is worth over three times that sum, even in Neuhausen. Mr. Youmans' summary, too, would convey the impression that "light giving manufacturers" had not gone into this subject with great thoroughness; but as they did so months ago, they can readily overlook the imputation that neglect of their business is one of their characteristics. It is regrettable, though, that the publication named seemingly sponsors a study of this subject so at variance with the knowledge thereon of the gas manufacturer of to-day, for many a lay reader of the *Monthly* might, on perusing Mr. Youmans' paper, be tempted to look out for a bargain in "rights" of one sort or another connected with the development of the acetylene industry.

The New York "Special" for the St. Louis Meeting.—He who travels safely travels far—so the Italian proverb hath it; in fact, the aforesaid proverb, if memory is to be trusted, also contains the suggestion that he who travels slowly travels safely; but the delegates to the St. Louis convention of the American Association will likely be satisfied with speed and safety. When to these is added the attraction that is of brotherhood, it would seem that the perfection of travelling had been attained. It is in that view and with such purpose that the securing of special cars—it is more than likely a special train will be needed—to leave New York by way of the Pennsylvania Railroad, at 2 P.M. of October 25th, is being arranged for. Delegates accompanied by their wives or daughters will have a reserved car. Applications for accommodations should be forwarded as soon as possible to Mr. C. E. Sanderson, 32 Pine street, so that no failure may result.

Notes.—The sum of $71,000 was recently paid into the city treasury by the Baltimore Consolidated Gas Company on account of taxes.——The contract for the public lighting of Le Roy, N. Y., by means of arc lamps, has been awarded to the Le Roy Gas Light Company.——The Board of Gas and Electric Light Commissioners have agreed to the issue of $30,000 bonds by the Chelsea (Mass.) Gas Light Company.

[From *Engineering*, London.]

Gas Lighting by Incandescence.

It required the appearance of a series of articles on gas lighting by incandescence in a foreign journal to remind us that since 1887 this subject had not been fully reviewed in our columns, but had only formed the substance of notes and short communications. In that year[1] we published a paper on the subject from the Proceedings of the American Society of Mechanical Engineers at Washington. Various systems, those of Clamond, Fahnehjelm, Lewis, Sellon, Welsbach and others, had then entered upon their practical stage, and the public were calmly looking on and reaping the benefit of the rivalry between the new electric light and the improved old gas light. That paper laid down the requirements attendant upon a successful system of gas lighting by incandescence, the most important of which were the following: There must be sufficient inducement to adopt the new light; the light must be better and steadier; existing fittings should not be interfered with; the cost of alteration and additions must be small; the management must be as simple as that required for gas; breakage and derangement unlikely, and the cost of renewals inappreciable; the consumption of gas must be decreased, and this gas be burnt more perfectly in order to reduce the objectionable effect of gas consumed in dwellings; the light must not deteriorate with the use of the illuminating medium. All of these conditions could not rigorously be fulfilled, else the electric light might have succumbed in its infancy. But there has been a brisk, healthy development in both fields; neither industry has stifled the other. The arc lamp, which for some time was a common feature of shop windows, has had to retire again to more suitable quarters, and where we now notice a constant bright light, less white than the arc, or less blue, and hence less striking to our gas lamp and candle-fed eyes, we are sure to find the incandescent mantle.

The articles mentioned above were published by Mr. Wilhelm Gentsch in *Dingler's Polytechnisches Journal*, a journal which excels in *résumés* on technical progress. The full title is "The Incandescence Gas Light; Its History, Character and Effects." The paper does not give a survey of the practical adoption; an epitome of recent improvement will, however, be acceptable. Although everybody knows pretty much what is meant by the term gas light by incandescence, it would be hard to find a gas light which does not belong to that category. We restrict the term to flames in which some foreign body, not contained in the gaseous fuel, some compound or oxide of metal, is raised to incandescence, not the carbon which is liberated in the flame. The prototype is Drummond's oxy-hydrogen limelight of 1826 or 1828, in which the gas jet played upon a cylinder of lime or magnesia. For any but special purposes the oxygen and hydrogen must be replaced by ordinary coal gas, and the lamps be of such a kind as to suit our gas fittings and pipes. Tessié du Motay tried, in 1867, a mixture of coal gas and oxygen in the gardens of the Tuileries in Paris and at other places, but financially the experiment failed. Linneman reverted to the same idea in 1886 for the purpose of obtaining very intense flames by means of moderately compressed coal gas and oxygen: 24 liters of gas and 15 liters of oxygen yielded 60 German candles, 37 gas and 26 oxygen 120 candles, 48 gas and 44 oxygen 200 candles; one German candle is about 1.13 British standard candles. The experiments were encouraging in so far as the little zirconia disc sent out an increasing amount of light with increased gas supply. But the more intense flames produced a whistling sound. Drossbach has utilized the Maughan burner for such flames, and Kochs has constructed a surgical lamp on these lines. We will consider first the older forms of incandescence burners. To these belong, in a measure, Fahnehjelm's water gas burners, inasmuch as they were in full use at the works of Messrs. Schultz, Knaudt & Co., Essen, already in 1884. Where water gas is available, this system has proved successful. Otto Fahnehjelm, of Stockholm, forms thin rods, not thicker than the lead of ordinary pencils, of magnesia, and clamps two rows of these rods in a metal holder (Fig. 1). His patents mention lime, zirconia, silica and other materials, in addition to the magnesia. His improved combs consist of the oxides of magnesium, calcium, beryllium and zirconium, and are coated with the refractory oxides of the heavy metals, chromium, manganese, nickel, cobalt, copper and tungsten. These oxides can be applied by means of a brush, as finely divided in emulsions of starch gum, soluble silicates, or simply as solutions in water or alcohol.

Fig. 1.

Following Mr. Gentsch, we will first discuss the incandescent materials. Platinum gauze and baskets, and also quartz, were employed by Davey, and later, in 1839, by Alexander Cruikshanks. The zirconium earth, which figures in so many patents, had been suggested and tried by Tessié du Motay in 1868, when he obtained an English patent for its use. It may, however, be granted that we owe the practical success of the incandescent mantle largely to the researches of Dr. Auer von Welsbach on rarer earths. Every metal and oxide has been tried, that offered the least chance, and it is rather surprising that even in comparatively recent days so many have engaged in such experiments which must necessarily be expensive, and cannot be fruitful unless continued for a long time. The medium must have a high radiating power, must resist the intense heat, neither shrink nor evaporate nor disintegrate, and the delicate structure must be reasonably strong. As regards radiating power, the rarer earths are not by any means equally effective. M'Kean has found that with a burner consuming 85 liters of gas per hour under a pressure of 25 millimeters:

	Hefner Candles.*
Thoria gave a bluish white light of	3.56
Lanthana gave a white light of	28.32
Yttria gave a yellow white light of	22.96
Zirconia gave a white light of	5.36
Ceria gave a reddish light of	5.02

*The Hefner unit is 0.862 German candles, therefore almost the same as the British standard.

By themselves, none of these earths are durable. It is by mixing them, with the addition of magnesia, that Dr. Auer von Welsbach has achieved success. Very good effects have been obtained with mixtures of 60 per cent. of magnesia and 20 each of yttria and lanthana; or 60 zirconia, 30 lanthana, 10 yttria; or 50 zirconia, 50 lanthana. The further admixture of neodidymia, by itself radiating an orange light, and erbia, somewhat greenish, has proved advanta-

Fig. 2.

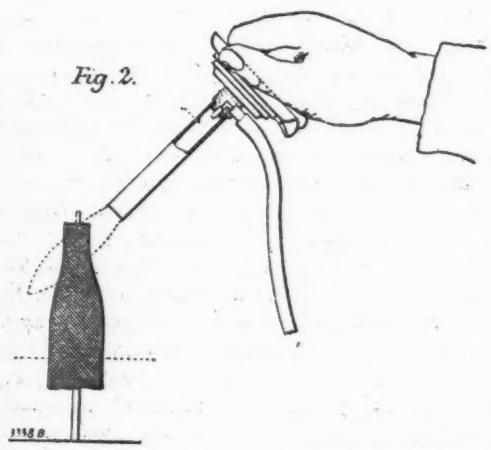


Fig. 4.

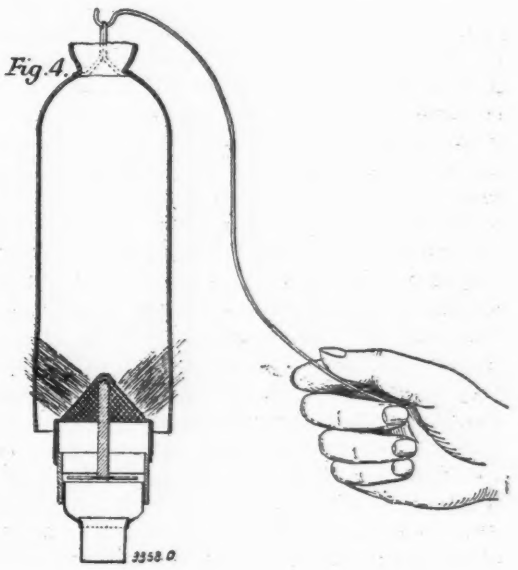


Fig. 3.

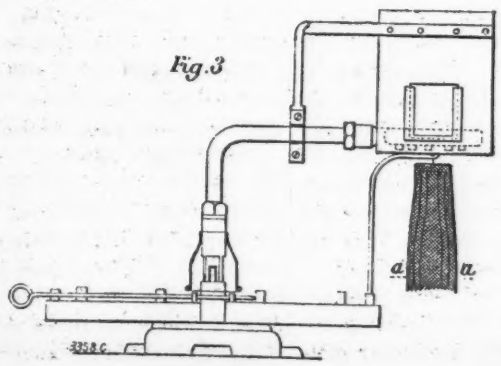
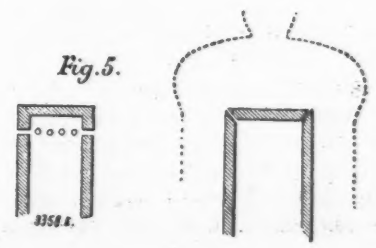
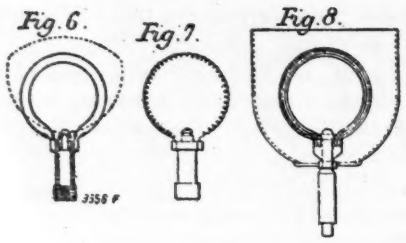
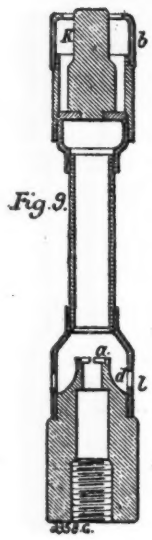


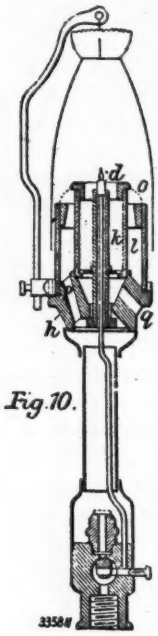
Fig. 5.

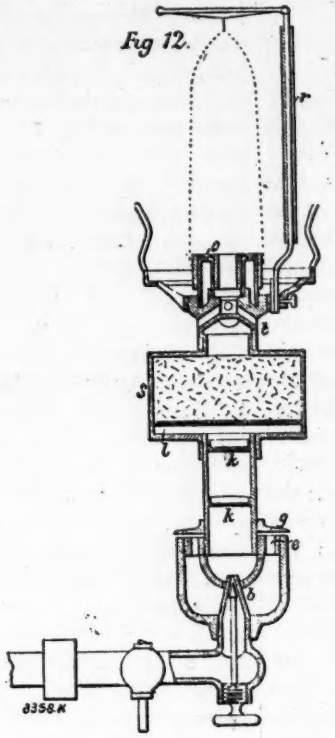


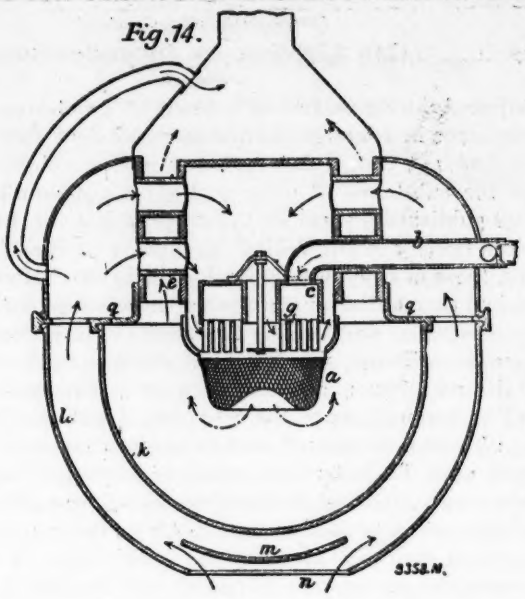
1. See *Engineering*, 1887, Vol. XLIV., pages 139, 469, 538.

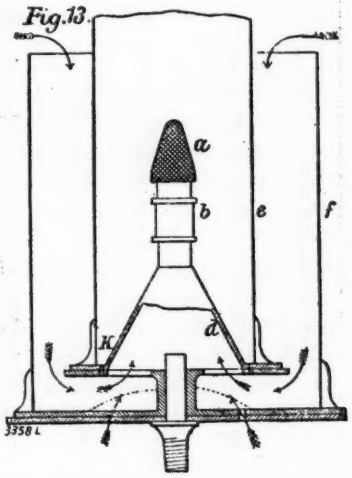


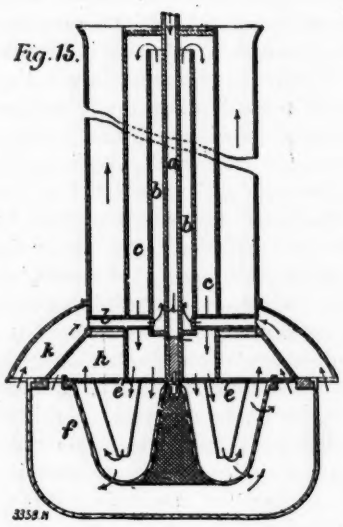


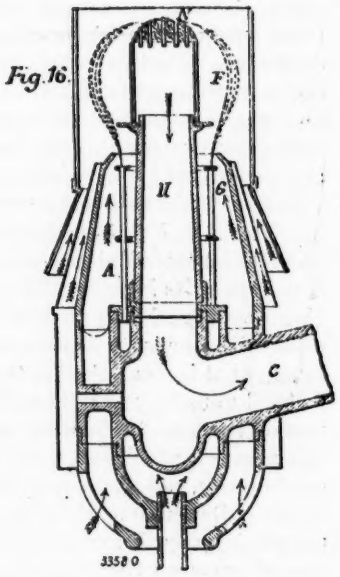


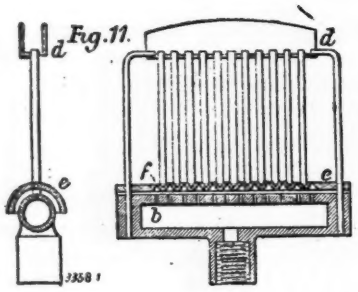












geous under certain circumstances. Magnesia and zirconia do not answer together. How Pofessor Welsbach isolated these earths from their minerals and formed the hoods has been described in our columns. Chemists have, however, learned more from what Schottländer published on the separation of the rare earths, and Mosander's old process of 1839 finds more favor again at present. Recently Professor Welsbach has made a larger use of thoria, which in itself requires a very high temperature, and of urania in conjunction with thoria and other oxides. The already hardened hood is once more impregnated with lanthana, and finally dipped into collodion or rubber solution to impart greater strength to the skeleton. The "Deutsche Gasglühlicht Actien-Gessellschaft," the Berlin Welsbach Company, prepares the hose from the finest Egyptian cotton, cuts hoods of the proper length, inserts the asbestos loop, impregnates, smoothes on a wooden mandril, and incinerates either in the simple manner illustrated in Fig. 2 by applying a Bunsen burner from above, or by a new device for which Mr. Krüger has quite recently secured a patent, illustrated in Fig. 3. In this apparatus the mantle, attached to a stand, is played upon by a uniform, conical flame until the incineration has proceeded about two-thirds downward to the line *a a*; it is then removed, the completion of the process proceeding automatically. The skeleton is afterwards further heated, and at the same time smoothed and shaped by the aid of glass rods. This operation requires very great skill and care, and is now performed in the manner shown in Fig. 4. The mantle is held, lowered and raised over a conical burner, from which a funnel-shaped gas jet issues under a head of 1 meter of water. The strongly heated parts widen out, and irregularities are thus removed. This apparatus will probably render the previous incineration unnecessary.

Pflücke (Fig. 5) uses for these purposes a burner for compressed air or oxygen and gas, whose cap has horizontal ports for widening the mantle and one oblique port for acting upon some particular spot. Frederick Lawrence Rawson shapes the hood over a platinum mandril, heats it while there, and finally dips into melted paraffine or paraffine dissolved in some hydrocarbon. Haitinger obtains a pinkish light, which can be rendered more whitish by substituting manganese for chromium, by impregnating with 100 parts of nitrate of aluminum and from 8 to 16 parts of chromic oxide dissolved in nitric acid; the presence of certain acids, phosphoric acid, *e. g.*, of smaller quantities of alkalies and of zirconia is not considered injurious. Schneider believes in a mantle core of platinum, quartz, asbestos, etc., obtained either by interweaving with the cotton threads, or by dipping the incombustible skeleton repeatedly into a liquid in which fibers are floating. Eckl goes back to the asbestos cylinder, cone or lamellæ. The oxides which withstand the heat of the first treatment are to be coated with lithium chloride, magnesia, iodide of potassium, which, one would think, will hardly prove sufficiently refractory. Rosenthal covers wire gauze with a fine textile fiber and coats with porcelain earth. Among the plentiful English patents Mr. Gentsch found little of practical value. He contents himself with mentioning a few patents, mostly dating from the eighties, Lake, Stephan, Davies, Schoth, Paget and Kintner, and Hirschfeld; most of them have been noticed in our patent records.

The shape of the Welsbach mantle seems best adapted to realize the highest light efficiency. With proper regulation only a small part of the fuel gases pass through the pores of the mantle, the main volume rising straight upward. Too high a pressure may result in an expansion of the mantle and in a loss of light. Thus Schilling was able to raise the candle power of a Welsbach burner from 49.6 to 53 and 74.8 Hefner units by supplying 75, 85, and 105 litres of gas under ordinary pressure. The hood had originally given 55 candles; after doing duty for 900 hours, the luminosity had sunk to the 49.6 units. In another case, however, 64 litres yielded 50.8 Hefner units, and 103 litres only 23.6. For such reasons, simpler appliances, like those of Lungren and

Fig. 17.

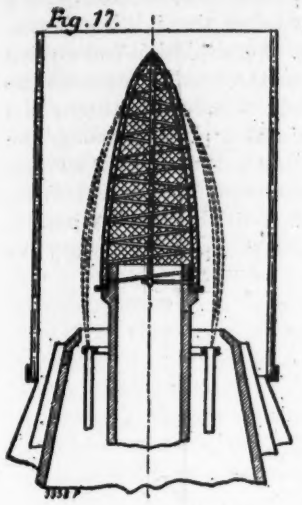
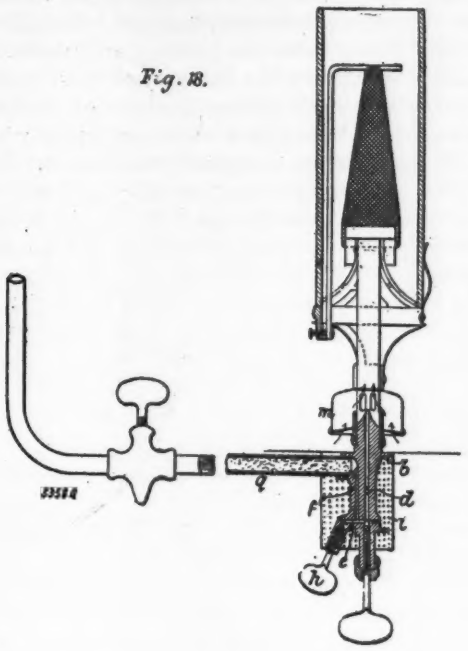


Fig. 18.



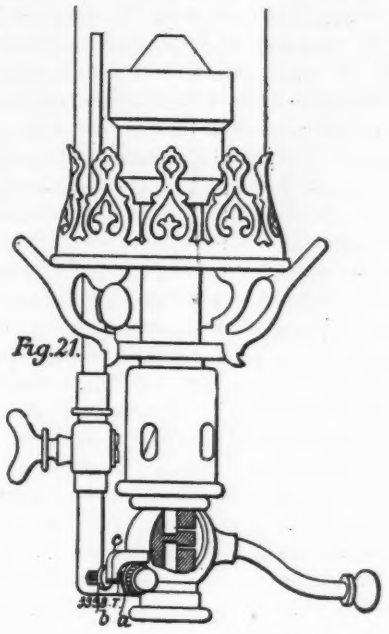


Fig. 23.

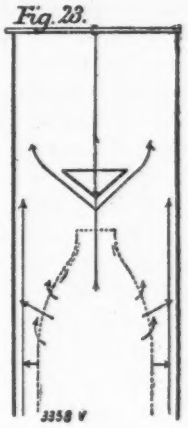


Fig. 19.

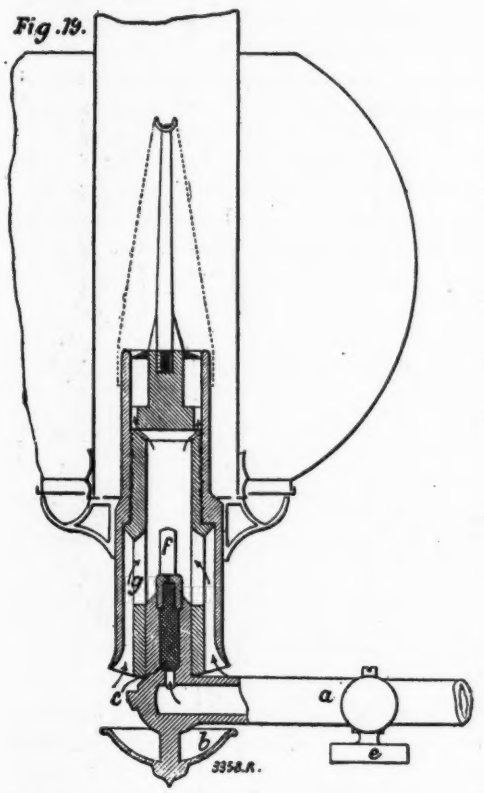


Fig. 20.

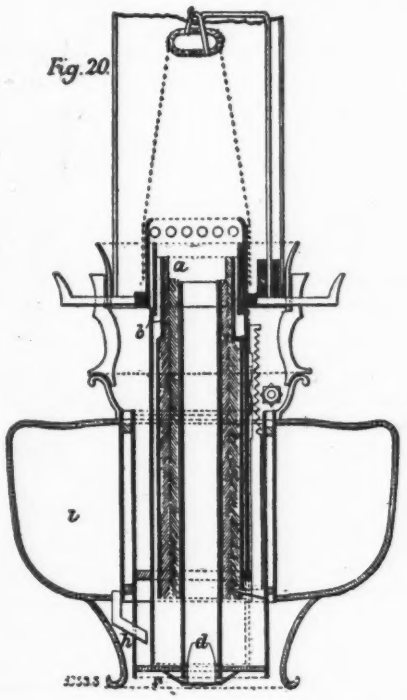


Fig. 22.

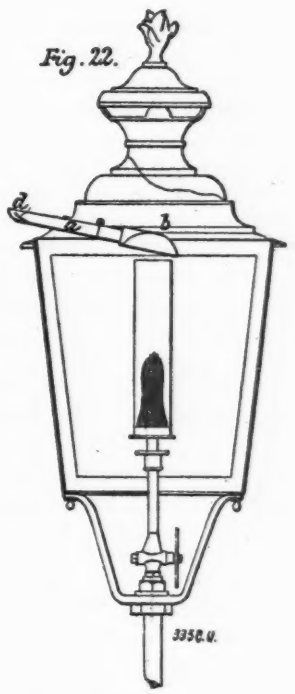
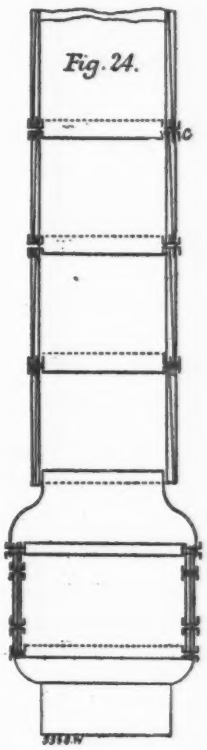


Fig. 24.



of Barnett, are not likely to give much satisfaction. Lungren applies threads of magnesia, zirconia, etc., to an ordinary batswing burner (Figs. 6 and 7); the guide of Fig. 8 was added later, probably because the flame did not envelop the thread. Barnett has suggested a slotted cylinder and perforated ribbons, and also cylinders consisting of fine tubes.

Coming to burners, Mr. Gentsch first illustrates and describes the older types of Lewis, Clamond and Sellon, which we have already noticed. Pintsch's burner (Fig. 9) exhibits some minor novelties. The gas pipe is covered by a little perforated disc *a*, and the air passages are below at *l*, so that the gas is not deflected by the inrush of air. A similar arrangement has been adopted by Welsbach, who closes the gas pipe by a plate with several perforations which help to distribute the gas in the burner tube. To prevent any explosion within the tube, Pintsch inserts the steatite body *k* in the upper part of the tube. The capsule *b* which surrounds this body serves for centring the hood. Welsbach prevents the explosions, and the striking back of the flame, common to all burners of the Bunsen type, by fitting a piece of gauze over the mouth of the tube. This device does not always answer. In that case the burner begins to sing before any damage has been done. If the burner be then turned down sharp and reopened quickly, the normal flame will generally appear at once. The gauze mentioned also supports a little cone which produces a ring jet of gas. This is a slight, but not unimportant improvement of Welsbach's, as it makes a small volume of gas do for a good-sized mantle. A Pintsch burner for mantles of large size is illustrated in Fig. 10. The head of the burner consists of two concentric cylinders, leaving the ring channel *l* for the explosive mixture, and the inner chamber *k* for air. The plug *h* with its two ports *p* and *q* is made of a poor conductor of heat; the pilot jet *d* will be explained further down. A curved piece of wire gauze *o* closes the chamber *l*. Stewart's burner, Fig. 11, one of his various proposals, does not look particularly promising. The gas pipe *b* ends in a T capped by a half cylinder *e*, from which gas and air mixed escape through the holes *f*. The rods or hollow tubes *a* are arranged between *e* and the fixture *d*. Jackson and Daniels (Fig. 12) take great care in thoroughly mixing the hydrocarbon to be burned, which may not be odorless, with air. The gas supply is regulated by means of the spindle *b*, the air supply by turning the ring disc *g*—the air enters through perforations *e*. The mixing is assisted by three screens *k*, *k*, *l* and completed in the chamber *s*, which is packed with hair, asbestos, fibre, etc.; the ring of the Argand burner is capped with wire gauze *o*. The ports *t* admit air to the inner part of the flame; this arrangement must have a cooling effect. Lest the attachment of the mantle might become overheated, the support *r* is made of a poor conductor of heat.

Increased luminous intensity can be obtained by means of higher temperature, with certain restrictions, and by other methods. The compression of the gaseous fuel, which Pintsch has very successfully utilized for lighthouses and light buoys, does not commend itself for domestic purposes. Nor does Berton's proposal to mix coal gas with nitrous oxide instead of with air. For the simple Welsbach burner, the preheating of the fuel gases on the regenerative principle would hardly be an improvement. For other types this principle may well be employed with advantage, provided the apparatus does not become too complicated. We illustrate one of Lewis's devices (Fig. 13) with its

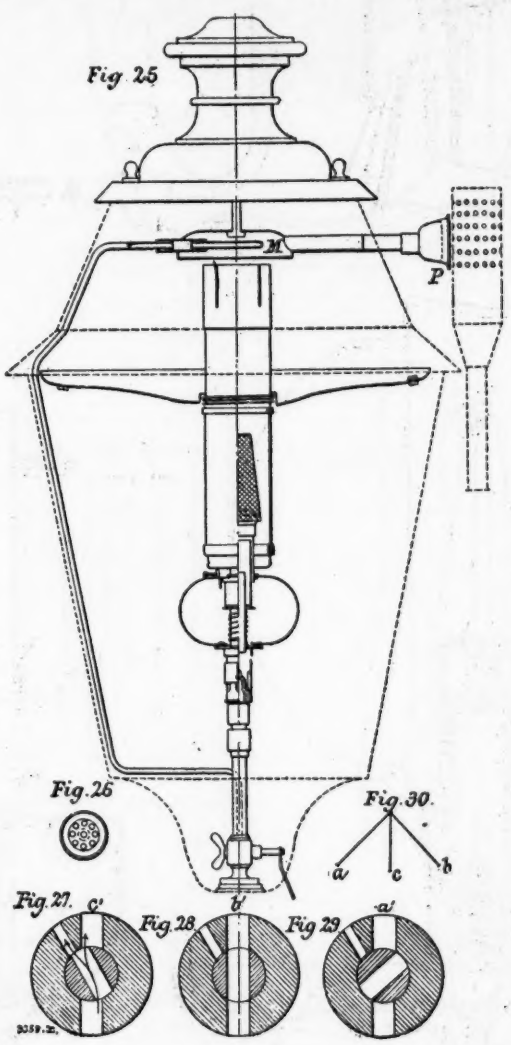
cap of platinum netting *a* on the steatite stem *b* over the conical perforated distributor *k d*, and with its two glass chimneys *e*, *f*. In the more complicated device of Clamond (Fig. 14) the gas passes through the horizontal tube *b* into the ring chamber *c*, and through the little tubes *g* on to the magnesia basket *a*, to which Clamond seems to have clung faithfully. The air entering at *n* is deflected by the curved disc *m*, and flows in the manner sufficiently indicated by the arrows. The outer globe *l* and the passages at *q* were added to keep the inner globe *k* cool. Kiesewalter has suggested several lamps with concentric tubes of somewhat doubtful utility. The gas passes down the pipe *a* (Fig. 15), mixes with air entering in preheated condition through *k* and *l*, goes up *b* and down *c* again to burn below the safety gauze *e* and to heat the luminous cone *f*; the combustion products escape through *h*. More to the point is a recent patent of Frederick Siemens, concerning a regenerative gas lamp (Fig. 16) having its flame F proceeding from a row of tubes G circularly arranged in the air channel A. The products of combustion pass through a previous body F of refractory material, and descend down the central channel H to a lateral outlet C. In another type (Fig. 17) a central stem is used upon which the flame plays in a similar manner. Mr. Fr. Siemens also directs the flames from two slightly inclined burners on a network screen. Mr. Gentsch objects that these arrangements give rise to two sources of light of different color. It also looks as if the flame would attack only certain parts of the incandescent medium.

The adaptation of the incandescent light to liquid fuels seems tempting, but involves considerable difficulty. The Bunsen burner is not easily modified in the necessary manner. Campbell introduces the gasoline through a pipe packed with asbestos *q* (Fig. 18); here and in the bores *f*, *e*, *d* of the brass piece *b*, the gasoline is evaporated; the air enters under the bell *m*. The heating is effected by a little flame burning within the chamber *i*, which surrounds *b*. This flame is regulated by the screw *h*. Freese's burner, Fig. 19, looks simpler, but not much safer. The benzine supply pipe *a* is heated from outside by a little benzine burning in the dish *b*. The cock *e* is opened when the pipe *a* has become hot. The vapors then rise through the gauze chamber *c* and the tube *f*, air entering through the ports *g*, Lintzmeyer (Fig. 20) describes a wick lamp. The wick *a* moves together with its sleeve *b*, and both are screwed right down to *h* when the lamp is to be extinguished. The benzine is contained in the holder *i*. Air is admitted down below at *f*, where a cone *d* has been inserted for adjustment.

The regulation of the gas supply and the flame is an important problem, since every flame requires a certain height and shape to yield maximum efficiency. Gould & Co. place two perforated plates over the gas outlet in the Bunsen, and alter their respective positions. Fischer & Co. (Fig. 21) fix a projection *c* to the valve spindle, and limit its play by means of the screw and nut *a b*. Meyer fits the real chimney, which has slots at its lower end, into a short cylinder, which may also be slotted. Moeller has taken a British patent for a sleeve for the air-holes of a Bunsen burner. Bell regulates the gas supply by means of a piston, against both sides of which the gas plays. Weil & Rosenthal provide the bottom of the mixing chamber with alternately small and large holes. When the incandescent hood is doing duty, the gas passes through the smaller holes and the corresponding perforations in a disc above. When the hood is to be exchanged, this disc is turned, more gas is admitted, and the hitherto non-luminous flame becomes luminous.

Mr. Gentsch next comes to the lighting of the burners. Most of the devices not being characteristic to the incandescent flame, we shall deal briefly with this section. Muchall's curious and simple device has been introduced at Wiesbaden. A sort of inverted ladle *b* is pivoted over the chimney (Fig. 22); the gas is caught by this ladle and conducted through the tube *a*, which is almost closed against rain and wind by the little tongue *d*. Pilot jets ought to be on a level with the base of the flame, and not outside the mantle, whilst the common match is applied at the top of the chimney. The gas company in Munich introduces a pilot jet through a hole in the chimney, just above the mantle.

A modification of the ladle device, in use at Munich, has according to an interesting communication[1] which Bigeard brought this summer, at Clermont-Ferrand, before the Société Technique de l'Industrie du Gaz, been introduced at Angers. At first the hoods broke frequently; the trap-doors were then closed, which improved matters; finally a new type of lanterns was adopted. The burner (Figs. 25 to 30) is supported, not on a spiral spring only, but on four steel arcs; the chimney, which consists of glass rods, is further encircled above by a brass spring; beyond this spring the chimney appears to be continued in a metallic tube ending ¼-inch or a little more below the lighting device. When these two portions are further apart, the explosion consequent on lighting the lantern becomes dangerous to the hood. The pilot gas branch containing the lighting appliance ends outside the lantern in a little bell-shaped enlargement M with perforated plate, to which the gas lighter is applied from outside. Before this is done, the little finger projecting below from the lantern is displaced, and the gas cock opened by these means. When the finger points to the left, the cock is closed; when thrown over to the right, the gas passes through the



pilot branch and a little also up the burner pipe; when hanging down vertically, the burner alone is fed. The hoods are suspended from ferro-nickel rods, which at first, with too plentiful a supply of gas, gave way; the heat also devitrified the glass. The light is decidedly better than formerly; the improvements had, however, not done service for a sufficient period for any final opinion to be expressed regarding the economy of the system. The lanterns contain only one burner each.[1]

Electric gas lighters have their drawbacks, like everything else. Mr. Gentsch describes those of Riedinger, Stern and Daus, and of Stegmeier and Geyer, which are specially constructed for incandescence gas lamps.

We might mention here an automatic lighter also of quite recent date. After unsuccessful experiments with spongy platinum and palladium, Kanellopoulos and Kratz-Boussac[2] have inserted a little condensed palladium in a specially prepared button of carbon, not larger than a lentil, of great porosity; two fine platinum wires protrude from the mass. The gas of the pilot jet strikes the button and wires, and is ignited in two seconds; the burner then catches fire. Near the flame is suspended, by means of a rod held by a fine tube of compressed magnesia, a platinum wire, which a coiled spring below tends to pull downward. As soon as the expansion of the heated wire permits this, the valve of the pilot jet is closed; on turning out the burner, this valve will open again. The combination of spongy palladium and carbon seems novel, otherwise the device does not look more promising than its many predecessors. A hand lighter based upon the same principle may prove more practical, though of very limited applica-

1. *Chemische Industrie*, 1896, August 15.

1. Abstracted in *Revue Industrielle*, 1896, August 22.
2. *La Nature*, 1896, August 8, page 149.

tion. The device resembles an electric cigar lighter of T-shape; when held over the open burner, the gas passes through a tube containing the button, and is ignited at the outlet.

The next question to be discussed is the protection of the mantle. The common glass chimney is apt to crack, and would do so, some authorities assert, with a certain regularity after a certain period and at about the same level. Fig. 23 shows that, owing to heat radiation from the mantle, we may expect the lower part of the chimney to become much hotter than the upper part, and that a deflecting cone c ought to prove beneficial, as it directs the hot ascending currents towards the wall. Reich & Co., therefore, fit two chimneys into one another, permitting each to expand according to its liking, the outer or the inner ring overlapping. Fritz suggests several partial concentric cylinders. Chimneys made of glass rods have found application, these rods have been made prismatic to effect diffusion of the light. Loll uses a chimney composed of hollow glass tubes. Teller found that four street lamps in Munich required 25 new glass chimneys in two months, and he went in for mica. But the compound mica cylinders of Schwintzer and Graff (Fig. 24) with their metal clamps c hardly look quite the thing. Others have made the lower cylinder of mica, or have inserted an inner mica cylinder. But mica always requires some metal fittings which are awkward. Several inventors have busied themselves with devising means of protecting the mantle if the chimney should fly to pieces. Bruère effects this by the aid of two nickeled steel rings with four braces which surround the mantle like a cage. It is to be expected that this would be an efficient protection against the broken fragments of glass. In order to avoid any disturbance when the chimney is to be cleaned, Gutmann has constructed two-part hinged chimneys, and Ohlen and others have contrived means for facilitating the putting on and taking off of the globes, etc. Globes and lanterns are also discussed by Mr. Gentsch.

(To be Continued.)

Compressed Air as a Hoisting Power in the Foundry.

[A paper read by Mr. George A. True before the last meeting of the Western Foundrymen's Association.]

Before taking up the immediate subject at hand, it will be necessary to consider for a moment the adoption of air as a principal distributing power for all classes of foundry work. So wide are its applications in this line that one is tempted to see a foundry with no steam engine other than the one which drives the piston of the air cylinder of a compressor—unless, under favorable conditions, a separate steam engine be used for the blower. If the writer were to-day installing a foundry of, say, 20 to 50 tons daily capacity, the temptation would be very strong to adopt compressed air as the only transmission power. We are not aware that such an example exists in foundry practice, and can recall but one instance where this system has been adopted as the prime distributing power by a manufacturer in any line, and that one, the Weurpel Company, of St. Louis, was unfortunately short lived and afforded but little opportunity to show what could really be done.

The power problem of the foundry, however, seems to invite a ready solution by this system. The various power units are almost invariably widely scattered, and many times must be portable, necessitating a power easily distributed over a large area. In the average foundry the fan or blower is the principal item of power consumption for several hours during the day; and the power requirements, if tabulated, would result somewhat like the following, taking as an example a foundry of 30 tons daily output:

Blower.....20-H.P. for 4 hours = 80 H.P. hours.
Mills and miscellaneous power.. 6-H.P. for 3 hours = 18 H.P. hours.
Hoisting average..... 5-H.P. for 10 hours = 50-H.P. hours.

The last power item is intermittent in actual work, but the need of it extends throughout the day and calls at times for a much higher horse power than the above average, but generally a much lower amount of power is used. If the foundry is modern and progressive it will also use power for sand sifters, air chippers, cleaners, etc., and under special conditions other power machines would be desirable if air is used, when they might be impracticable under any other power system.

The predominant practice of the present time is the installation of one steam engine of sufficient power to meet the demands of the entire establishment, and the distribution is effected by means of line shafting and belts. In occasional instances electric motors are economically used for the distribution of the power. Frequently a separate steam engine runs the blower, while a system of shafting and belts attends to the balance of the equipment, but it so happens that the arrangement of an average foundry is such that power so applied is invariably on a most wasteful basis. Countershafts, clutches, bevel gears and combinations of square shafts and worm gears (on cranes especially), all running for the entire ten hours, result in a tremendous waste of power; 50 to 60 per cent. of the power is often used in turning the shafting alone, not to mention the loss resulting from the peculiar style of mechanism made necessary by the use of line shafts, and this friction loss goes on steadily throughout the day. This one item has furnished the electricians with one of their best arguments for the adoption of an electric motor system for driving the various tools and machines used intermittently, and the same claims can be advanced with added emphasis for compressed air. The writer recalls one instance of a foundry (or rather a group of foundries, melting over 100 tons daily), in which over 400 feet of shafting conveyed the power to the various widely separated machines, and 500 feet would probably be a low estimate of the amount of belting in daily service (and this does not include a rope drive or two), all in constant motion whether doing useful work or not.

With a compressed air system, using engines on each machine, power is used only while the machine is in operation. When it stops the consumption of power stops, and the air in the service pipe will stand idle all day if necessary; then when required it is instantly ready for service if even for a moment only. We all know how tempting the use of separate steam engines has been in the past, and that the principal objection to that system is loss through condensation. Their use on cranes has been curtailed owing to difficulties attending transmission of both live steam and exhaust. It is in this intermittent work that the largest item of saving records itself, and much of the power work of a foundry is intermittent. Especially does this apply to the various hoisting operations.

Mr. Richards asserts that compressed air costs about 5 cents per 1,000 cubic feet of free air. This is the basis usually taken in making estimates, and at first thought it seems to be very cheap, but with a modern 4-stage compressor the cost will be much less; in fact, in some cases it is difficult to see how the cost per 1,000 cubic feet of free air can reach 4 cents, including depreciation, repairs, oil, fuel, interest and miscellaneous items. Assuming 5 cents, however, as a basis, the power cost of lifting 1 ton 1 foot, in a direct acting air hoist, is about 7 cents per 1,000 ton feet. The average amount of hoisting in a foundry of 30 tons daily output is 2,000 ton feet, so the power cost of doing this work, including power repairs, power labor, fuel, oil, interest, etc., is not over 14 cents per day. The operating labor is to be added to this to estimate the total cost of hoisting, which is about 25 cents per 1,000 ton feet. The total cost, therefore, of hoisting 1 ton 1,000 feet will be about 32 cents, or in a foundry of 30 tons daily capacity about 65 cents per day, using direct acting vertical air hoists. If geared hoists are used, the amount of air necessary to lift a ton foot will be increased and the power and operating cost will be more nearly represented by 90 cents per day.

The ordinary vertical direct acting air hoist is one of the most efficient hoisting machines in use. It utilizes in useful work fully 85 per cent. of the power delivered to it. Few geared hoists, electric, hand, air motor or steam, have a higher efficiency than 60 per cent. Some electric cranes show a loss of 65 per cent. in friction, or 35 per cent. efficiency, although the average efficiency of the electric crane gearing is perhaps nearer 50 per cent. The average hand power crane with a drum winch shows only about 45 per cent. efficiency, based on the power delivered to the machine. The average differential or worm geared chain hoist has 30 to 40 per cent. efficiency and the cost of operating, measured in time and wages, is very large.

Another advantage of the direct acting air hoist is the wide variation of speed obtainable by the simplest possible means and involving practically no waste of power. With a fixed load the speed will vary automatically with the size of the port; and with a fixed port opening the speeds will vary with the weights lifted. The area of the port opening of the valve may be controlled in the usual manner by the distance the valve is opened, or in the best valves a throttle is provided independent of the main lever, and this being fixed for a given port opening, the valve may be thrown fully over. This device will be appreciated by any one who has attempted to control the port opening on a hanging hoist by pulling on cords attached to the lever.

Thus far comparisons have been made with the direct acting or "cylinder" hoist, which is essentially a cylinder of cast iron, or steel, or brass, accurately bored and polished inside, and fitted with a piston and piston rod, and to the latter is attached a hook, and on the cylinder a hook or ring is provided for attachment to the trolley or beam overhead; the cylinder thus hangs vertically and the load is lifted by the admission of compressed air on the under or piston rod end of the

cylinder. This is apparently a simple machine, but if accurate or efficient work is desired great care and experience are necessary to properly construct it. Once properly made it is easy to take care of, its parts are few and not subjected to much wear, and are cheaply and easily replaced when worn. A poorly designed hoist or one cheaply constructed is not a good investment.

This cylinder type of direct acting hoist is capable of a number of modifications. The cylinder, with its heads and piston, its hooks and stuffing box, occupy considerable space vertically and require usually a

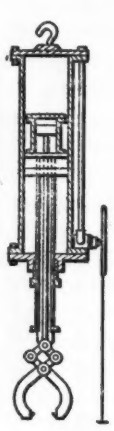


Fig. 1.—Grappling Hoist.

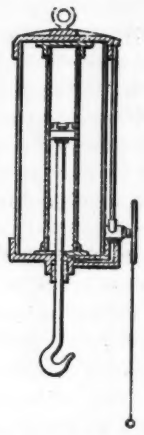


Fig. 2.—The Fisher Hoist.

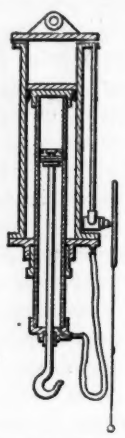
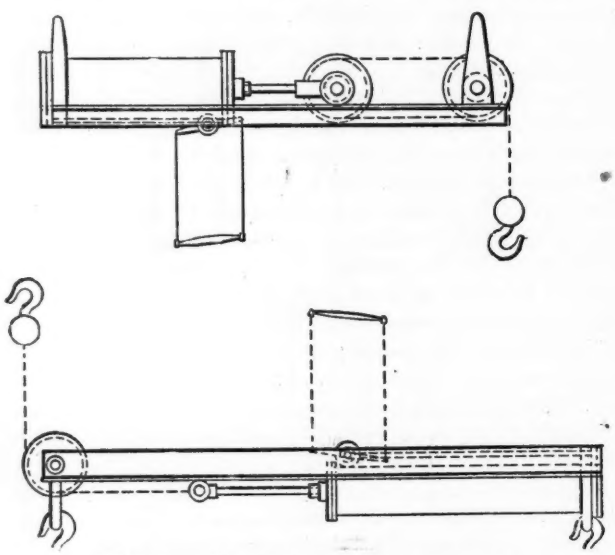


Fig. 3.—Hoist for Securing High Lift.



Figs. 4 and 5.—Horizontal Pneumatic Hoists.

fairly high ceiling. This should be borne in mind when selecting the hoist, for a very common mistake is that of choosing too long a stroke for the ceiling space. The distances to be added to the stroke to get the total length between bearing points of hooks when hook is lifted to its highest point (or to be added to double the stroke when hook is extended, to secure length over all) range from 1 foot in the small 4-inch or 5 inch hoists to 2 feet in the 16-inch to 20-inch hoists. If a swiveled hook is used these dimensions are increased about 50 per cent. Many times a long stroke is asked for when a short stroke would do as well; there is no advantage in this, and it is usually unsatisfactory, because it really reduces head room rather than increases it. Probably the foundry of the future will have its very lowest ceiling not less than 20 to 25 feet high, because vertical air hoists will become so essential that their influence will assert itself upon the architecture of the plant. Horizontal cylinders may be used in exceptional cases where vertical hoists cannot be used, and these are constructed in a variety of forms. Figs. 4 and 5 illustrate one type, and they may be applied to cranes in numerous ways. Fig. 3 shows another method of securing a high lift in a small head space. Other special applications of air hoists are also illustrated. Fig. 1 shows a hoist supporting a long operating cylinder upon its piston, designed for grappling. Two cylinders may also be readily combined for tipping a ladle or dumping a bucket by somewhat modifying this design. Fig. 2 illustrates a vertical storage hoist designed by Mr. Fisher, of the Griffin Wheel Company, and used in their plant. The ordinary vertical hoist is surrounded by a small receiver, and when traveling a considerable distance and the load is to be lowered and another load raised, air is taken from the receiver for this purpose. This is applicable to locations where a hose cannot conveniently be carried. Wherever an air cylinder can be used, however, whether on cranes or elsewhere, it is desirable to use the vertical direct acting type, because it is more easy to operate, is higher in efficiency, and hoists with a more even and smooth lifting motion than do horizontal or other types.

The elasticity of air when used in a direct acting hoist is well known and is many times an advantage. In a well made hoist properly cared for, the lowering of the load due to leakage is not sufficient to cause trouble. A uniform load may be held usually for several minutes at any point without perceptible drop. If it is desired to hold the load for a longer time, this may be accomplished by raising the piston to the top of the stroke and leaving the air pressure on; or by adjusting a slipping or pinching collar on the piston rod the load may be held by air pressure at any point. The raising of the load when pouring metal, due to expansion of air in the cylinder, is generally an advantage, obviating the necessity of hoisting the ladle, as it empties by opening the valve. If the rise is too great, a little air may be released. For certain special duties some hoists have been equipped with automatic release valves; others with slides and valves which automatically open for the admission of air to compensate for leakage and for the release of air when the load rises. An automatic means for closing the valve at top of stroke is serviceable in saving air and is assumed in the calculations in this paper.

When applied to cranes, positive action of the load may be obtained by the use of a water reservoir between the air pipe and the hoisting cylinder, with a regulating valve between reservoir and hoist. The hoisting cylinder then becomes practically a hydraulic hoist and should be constructed as such. The speed may be perfectly controlled by the regulating valve, or the load may be held indefinitely by closing this valve. A hydro-pneumatic appliance is of course open to the same objections that are advanced against a hydraulic hoist, especially in an exposed location subject to a freezing temperature. This may be overcome, in a measure, by the use of oil or an anti freezing mixture in the reservoir. The hoisting cylinder may be placed horizontally with the reservoir below it, but there is less friction and better results are generally obtained from a vertical cylinder.

There are numerous places where a direct lifting hoisting cylinder, either vertical or horizontal, cannot be used. Scant head room, short spans for jib of cranes, and occasionally a demand for a perfect or positive action without the elasticity of direct pressure, sometimes prevent the use of hoists of this character. It is here that the geared or air motor type finds its field of usefulness. We are all familiar with the modern 3-motor electric crane and with the well known steam jib crane so generally employed in pipe foundries. Undoubtedly the electric crane owes its popularity largely to the ease of transmitting the power from a fixed point to a moving machine. Until its appearance the power traveling crane in general use was either belt or rope driven or operated by a square shaft. The power was subdivided and reversed by an intricate system of clutches, bevel gears and frictions. No one would now think of returning to that "all day" fuel consuming method unless the crane travel was exceedingly short, or the conditions much more favorable than usual. The electric crane offered emancipation from such systems, in the form of independent motors for each function, an easy method of reversing, and a consequent minimum of mechanism outside of the motor, a variety of speeds and a simple and highly efficient method of transmission.

The 3-motor compressed air traveler possesses all these good points, with the addition of lower first cost and greater simplicity. With a proper pipe line the transmission loss is less than in electricity. The engines are as simple as those used for steam, and may be easily reversed and controlled. Rheostats and expensive controllers are not needed; and the speed is reduced by throttling and saving the power rather than by consuming it. The valves may be controlled as easily from the floor of the shop as from a cab—a feature well worth consideration in a shop of limited output where a crane man's time in a cab is a serious item of expense.

Air engines may be applied to jib cranes, elevators and other hoisting machinery with equal ease. They may be applied to the travel gearing of a crane with relatively equal saving as when applied to the hoist. Compact reversible engines may be readily and cheaply applied to present hand power cranes without materially changing the design, and the crane may still be operated by hand power at times when the power plant is not in operation. Air may replace steam in engines now in use on steam cranes. It is somewhat remarkable that founders making cast iron water pipe have not long ago adopted compressed air as a crane power. The conditions are peculiarly well suited for air; excessive heat, dust, smoke, intermittent work, and widely scattered ma-

chines in foundries of this class all offer it an inviting field. At present many of these foundries are operated by steam jib cranes, which could easily be converted into air driven machines. Some of the more recently built pipe foundry plants have installed electricity on traveling cranes, but if there is any place where air would be emphatically advantageous it is in these shops. With steam there is a great loss through pipe condensation, and the already heated air is rendered further uncomfortable by escaping steam and heated engines. Compressed air could be exhausted directly into the atmosphere of the shop and would assist in some degree in cooling and ventilating. There would be practically no loss in the pipes as compared with steam. Air is a humane power. It does not hurt a man if he is struck by a jet. It doesn't make him uncomfortable. It is the most pleasant of all transmission powers to handle and the most convenient to subdivide. The application of air motors also, to the gearing of existing hand power cranes, would result in a large annual saving; it would in many cases pay for the investment in less than one year after installation.

In the consideration of compressed air for operating a hoisting plant, the question of efficiency will at once suggest itself. There is a much discussed loss of power in the compression of the air, the importance of which may be great or small, depending upon the conditions. These should always be considered, and the question of availability and economy should be looked at practically as well as theoretically. And it is doubtful if one-half of the belt power or square shaft cranes in use will show as great economy in the use of power as a well designed air crane, without considering the large waste due to continuous motion of transmission parts, whether doing useful work or not. When the question of absolute saving in dollars and cents at the end of the year is considered there appears in many cases a decided balance on the side of air. When using a direct acting hoist system, with a hoisting machine efficiency of 85 to 90 per cent., a higher net efficiency for air than for electric or any other modern and practical shop power can be claimed with reasonable assurance. Using a mixed system, hoisting about half by means of geared hoists and half by direct cylinder, we may claim fully an equal efficiency with an electric geared hoist system. And using an air motor crane alone, as compared with electric motor, although probably a less power efficiency is obtained, a higher economy, investment considered, may in many cases be safely claimed.

While the conditions may vary greatly, we may make a reasonably accurate comparison on a maximum load basis which would show the percentage of power expended in useful work to be as follows: Using electricity as a transmission power, with geared hoists, about 30 per cent.; using air driving motors on geared drum hoists, 24 per cent.; using a system composed of half geared hoists and half direct hoists, 35 to 40 per cent.; and using all direct hoists, 50 per cent. Of course, when handling lighter loads the efficiency would be less. Such results surely do not make a bad showing for air. There is undoubtedly a fair saving of power in favor of the electric motor crane alone; but this showing of increased efficiency for electricity does not mean necessarily a greater annual economy; and a reduction to dollars and cents involves consideration of items like interest on investment, care taking and operating labor, every item of which shows a gain for air. Here is a difference between efficiency and economy. A machine may be highly efficient mechanically and still be comparatively uneconomical financially. An electric crane costs more than an air crane, and the interest on the difference in first cost will generally amount to more per annum than the saving in fuel due to the higher efficiency. It is our belief that the 3-motor air crane, for instance, would not represent a greater expense per annum, investment considered, than a 3-motor electric crane of the same size and capacity. Making a comparison with hand power as already stated, the cost of hoisting by manual labor in the foundry under consideration would be not far from $5 per day, equivalent in good times to $1,500 per year. By air it would cost $200 to $250 per year, or if we include interest on the investment, which is only fair, we will have a hoisting cost, when operated by hand power, of about $1,600, against $380 to $480 using air. The saving would go far toward purchasing a first-class air plant.

Consideration of compressed air, aside from its use as a hoisting power, is outside of the province of this paper, but since reference has been made to its exclusive employment in a plant, the subject of its availability for other purposes in foundry practice may be briefly noted. As already shown, the greater amount of power in the ordinary foundry is required to operate the cupola blower. In an imaginary foundry operated exclusively by compressed air, this blower, even if located at a distant point from the boiler, could be readily driven by a direct connected air engine provided with an inexpensive reheater, at an economy equal to, and many times greater than that obtained by a steam engine directly attached. There are well known advantages in operating a blower by an independent engine using either air or steam, the principal one being the ease with which change of blower speed may be effected.

In plants having the blower located close to the boilers steam could be used advantageously in the engines, and the air compressing plant be correspondingly reduced in capacity. The tumblers could be readily operated by motors, and here the exhaust could be also utilized. Sand sifters, portable or otherwise, are more readily operated by air than by any other power. A small hose, with a nozzle attached to overhead hoists, serves as an unexcelled bellows for dusting molds. The air chipping tool and pneumatic sandblast promise improvements in the work of cleaning castings, and the castings may be readily broken by pneumatic drops. In many cases it has been found advantageous to weaken a heavy casting by drilling a line of holes in it with a portable air drill, after which it readily succumbs to the blows of the drop. Air has an advantage over hydraulic power in exposed locations because it will not freeze; but if the pipes are improperly installed the heated air will deposit water, which will collect in inviting places and freeze as readily as any other water. This may be avoided by properly draining the pipe line, or, in particular locations, protecting it. Leakage is another item easily avoided if the plant is carefully installed. Large pipes should be used, 1½ to 2½-inch mains, the larger the better, with smaller connecting pipes. The receiver should be frequently drained, and an occasional "U" in the main, with a drip and cock at the bottom, will keep the pipes free of moisture. More than one receiver may often be advantageously used in a plant of large dimensions with intermittent work, one at the compressor, and others near the point of direct service. Reheaters on motors yield undoubted economy when used on a machine operating continuously for several hours. On cranes used infrequently, or on other intermittent work, it is doubtful if they would show much gain unless used in connection with an automatic attachment which partially turned off the heater while the motor was not operating. On cranes used almost continually, as in pipe foundries, a reheater at each engine would bring the air geared hoist very near, if not above, the electric hoist in mechanical efficiency. Direct acting cylinder hoists should be kept well oiled. A good quality of neatsfoot oil has been thus far found most suitable for preserving and softening the packing used in the pistons. Oil should not be allowed to get on to the rubber hose, unless a specially prepared hose is used—it causes it to decay. The pipe line, when first installed, should have all dirt or dust blown out before attaching it to the machines. An air hoist should be loaded and copiously oiled, and raised and lowered several times when first put into service, to get it into good working order. A pressure of 60 to 100 pounds has been found most convenient for general use.

Pinkney's Apparatus for Producing Gas.

On September 22d U. S. Letters Patent (No. 568,038) were granted to Mr. Charles W. Pinkney, of Smethwick, England, for "Certain improvements in apparatus or furnaces for producing gas from carbonaceous matter." Using the words of the specification:

This invention relates to apparatus or furnaces for producing gas from carbonaceous matter, and has for its principal object to provide means whereby the more volatile hydrocarbons or tarry matters can be readily and efficiently converted into fixed or permanent gases in the generator.

According to this invention, I provide (within a suitable casing, if necessary), a space for the lower portion of the fire, below this space being the outlet for the gas produced and above it a continuation of the fire space, the said continuation being constituted by vertical or inclined bars or grating, around which is a casing or inclosure, into which steam and air are admitted. Above the said bars or grating the fire space is continued, and terminates in a hopper by which the green fuel is fed into the apparatus. The lowest part of the fire space may terminate in a water well or lute to enable the ashes to be withdrawn without stopping the working of the apparatus.

When the apparatus is at work after the fire has been started, say to about the middle of the bars or grating, and green fuel has been supplied above this, the steam and air are admitted into the space surrounding the bars or grating and passing therethrough will pass down through the hot fuel beneath and be decomposed and take up carbon from the fuel, and at the same time the green fuel above gives up its volatile hydrocarbons or tarry compounds, which also pass down with the steam and air, and the whole is converted into gas well suited, for

instance, for use in gas engines, after it has been passed through scrubbers or other devices that may be necessary to treat it to fit it for use.

The bars or grating aforesaid may be arranged in any suitable manner, such as vertically in a circle or in an inclined pasition, so that the space they inclose is narrower below than above, the fire space below being preferably larger at its lower part than at its upper part. Doors or openings for lighting, stirring and inspection may be provided at any suitable parts of the apparatus.

The steam or the air, or both, may be superheated before they are admitted to the fuel, and this may be effected by passing them through pipes surrounding the bars or grating or the fire space, or the bars or grating may constitute the said pipes.

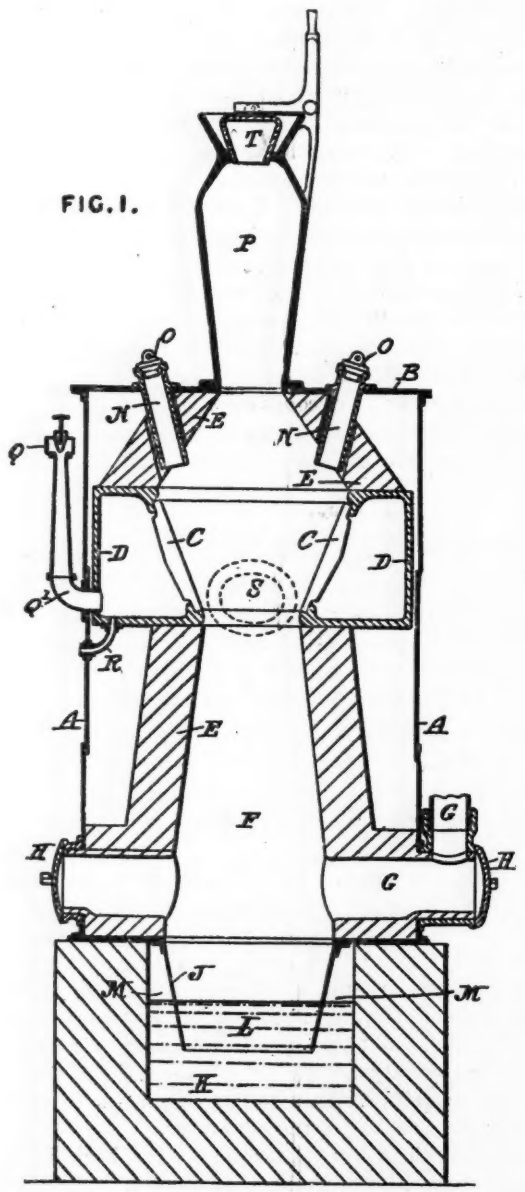
In order that this invention may be well understood, I have illustrated in the accompanying drawings an apparatus or furnace constructed in accordance therewith.

Figure 1 is a vertical section of the apparatus, and Fig. 2 is a plan. Fig. 3 is a section of the lower part of the apparatus at right angles to Fig. 1; and Figs. 4 and 5 are modifications, as hereinafter described.

The circular casing *A* is made of steel tightly riveted together at the joints, the top plate *B* being securely bolted to the said casing *A* to prevent any of the hydrocarbons leaking into the atmosphere. Surrounding about the middle or toward the upper portion of the furnace is a vertical grating *C*, inside the box *D*, the space between the grating *C* and box *D* forming a passage for steam and air to enter through the grating *C*.

In Fig. 1 the grating *C* is shown inclined, or of conical form, with the smaller part downward; but it can be vertical, as shown in Fig. 4, if desired.

FIG. 1.



The casing *A* is lined with firebrick *E* or its equivalent.

The part *F* of the furnace, extending from the grating *C* to the outlets *G* is preferably taper, as shown in Fig. 1 (the larger part being at bottom.) The doors *H* are for clinkering and cleaning purposes. Underneath the furnace at *L* is a water lute or seal for clinkering purposes when the generator is required to work continuously. The continuation *J* is formed slightly conical to prevent the fire inside the furnace from falling too quickly when the ashes or clinkers are being removed from the space *K* in the water seal *L* in the chamber *M*. The holes lined with tubes *N* are for stirring purposes, and are made secure, when working, by the heavy sealed plugs *O*. The fuel is fed through the hopper *P*.

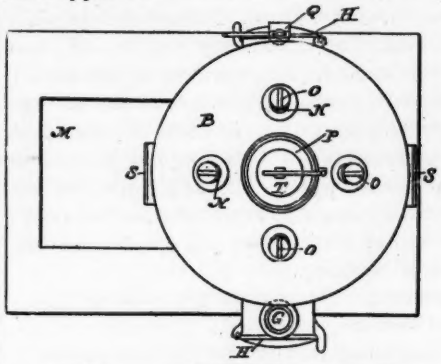


FIG. 3.

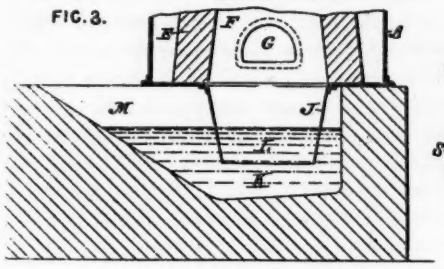
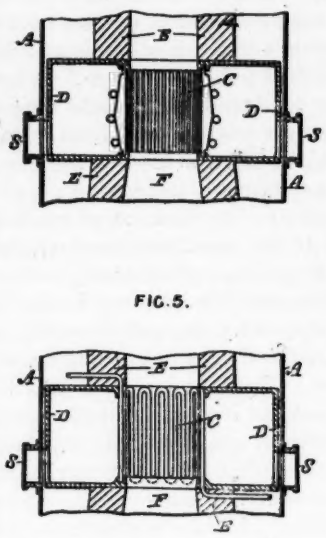


FIG. 5.



Q is the blower box, and *Q'* the steam and air inlet passage. Several blowers can be used, if desired, at different parts to insure the steam and air passing around the grating *C*.

R is a pipe used when starting to drain off any water of condensation caused by the steam coming into contact with cool surfaces, a cock being fixed at the outer end of the said pipe *R*, to be closed when the apparatus is at work. Any ash can be removed from the box *D* through the doors *S*. If it be desired to superheat the steam before it passes into the fuel in the furnace, any suitable arrangement of superheating pipes can be used. For example, a coil of steam pipes can be put inside the box *D*, close up to grating *C*, as shown in Fig. 4, or the grating bars can be made of tubing, through which the steam, on its way from the boiler to the blower, can be made to pass, thereby becoming highly heated. This is shown in Fig. 5.

When the apparatus is to be put into operation, water is placed in the chamber *M* to the predetermined height, and the continuation *J* is filled with ashes or small fuel to a level or about a level with the outlet *G*, and the hopper valve *T* is opened and a fire is lighted through the clinker doors *H*, which fire should be continued until it reaches the middle of the grating *C*. This can be seen by removing one of the doors *S*. The furnace is then filled up with fuel, and the doors *H S* and hopper valve *T* are closed, and steam is turned on at the blower box *Q*, which steam will mix with atmospheric air on its way down the passage *Q'* into the grating box *D*. The said steam and air will pass together through the grating *C*, into and down through the heated fuel underneath the grating *C*, to the outlet *G*. The said steam and air on their way through the said fire will become decomposed and take up carbon, and the green fuel above the grating is (owing to the heat beneath it) giving up its volatile hydrocarbons, which are also compelled to pass downward with the decomposing steam and air, so that the whole becomes thoroughly formed into carbon monoxide gas. It then passes out at the outlet *G* and may be passed through scrubbers into a gasholder or to the place of consumption or utilization.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed, I declare that what I claim is—

1. In apparatus or furnaces for producing gas from carbonaceous matter, a vertical or practically vertical chamber for the carbonaceous matter, the said chamber having, between the upper part for receiving the fresh fuel and the lower part provided at its lower end with an outlet for the gases, an intermediate part surrounded by a grate section, and means for introducing air and steam through said grate section, whereby the mixture of air and steam entering through the grate passes downwardly through the heated fuel beneath the grate to the outlet, carrying with it volatile hydrocarbons released from the green fuel in the upper part of the vertical space by the heat from the underlying fuel, substantially as described.

2. A vertical or practically vertical fuel space or chamber, divided into an upper zone for the green fuel having an inlet for said fuel, a lower zone for the incandescent fuel, having at its bottom a gas outlet, and an intermediate zone surrounded by a grate, and means for supplying air and steam through said grate to the fuel, whereby said mixture of air and steam passes downwardly through the incandescent fuel to the gas outlet, carrying with it volatile hydrocarbons which are released from the green fuel in the upper zone of the chamber by the heat from the underlying fuel, substantially as described.

3. An upright chamber divided into an upper zone for the green fuel, having an inlet for said fuel, a lower zone for the incandescent fuel having at its bottom a gas outlet, and an intermediate zone formed by an annular grate having its bars arranged in a substantially upright position, and a casing about said grate having a steam and air inlet thereto, whereby the mixture of steam and air passes through the grate downwardly through the incandescent fuel to the gas outlet, carrying with it volatile hydrocarbons which are released from the green fuel in the upper zone by the heat from the underlying incandescent fuel, substantially as described.

European Boiler Practices.

Engineering Record says that Mr. R. S. Hale, M.E., has recently submitted a report to the Steam Users' Association, of 31 Milk Street, Boston, Mass., giving the results of his investigations upon European boiler practices, Mr. Hale having visited England, Germany, France, and Belgium, for this purpose. While the report is more or less general in character, some of the points touched upon will, we believe, be of interest to our readers.

Regarding the types of boiler in use in the year 1895, Mr. Hale found that in England, 38 per cent. were Lancashire and similar types, 23.7 per cent., Cornish, 6.8 per cent. of the externally fired cylindrical type, while the boilers of the water tube type were found to be 1.8 per cent. In France the percentage of Lancashire and Cornish boilers is exceedingly small, while the externally fired cylindrical leads the list at 57.3 per cent. The externally fired multi-tubular, which evidently corresponds with the American return horizontal tubular boiler, represents 13.4 per cent. of the boilers in France, while none was found in England. The percentage of water-tube boilers in France was 5.7. In Germany the Lancashire represents 35 per cent., the Cornish 15 per cent., the externally fired cylindrical 14.8 per cent., externally fired multi-tubular 5.8 per cent., the locomotive 17.3 per cent., water-tube 4.6 per cent.

The Lancashire boiler which, as we previously mentioned, is found in England, is generally 30 feet long by 7 feet 6 inches in diameter. It has two internal flues about 3 feet in diameter and a grate in each of them generally 6 feet long. Galloway or cross tubes, 6 inches in diameter, five to each flue, are often placed in the flues back of the bridge wall. The gases after passing through the flues pass underneath the boilers to the front and then back along the sides to an underground flue. Such a boiler would have 36 square feet of grate, and 1,000 square feet of heating surface. Mr. Hale said, that when built for 160 pounds steam pressure, the boiler costs about $2,500 in England, and that it will easily deliver 6,000 pounds of steam per hour and more, although at this rate it is not very economical, but where used at a lower rate of combustion, or in conjunction with an economizer, it is as economical as any type of boiler. The boiler is easily cleaned and the outside is of easy access. The Cornish boiler is exactly like the Lancashire except that it has but one flue, placed in the center in England, while in Germany it is frequently placed to one side, with the idea of improving the circulation. The Galloway boiler is generally classed as a Lancashire, which it resembles in every respect except that the two furnaces meet back of the bridge wall in a single large flue filled with Galloway tubes.

After describing several other types of boilers, Mr. Hale takes up the question of English workmanship, which he finds to be fully equal to our best. In England, he states, no punching is allowed and the plates are always planed on the edges and then drilled in place. Steel is being used almost exclusively in England, while iron is still preferred in some places on the Continent. English makers usually figure on 20 years as the average life of a boiler.

Mr. Hale said that the internal flues in the Lancashire boiler are generally welded along the longitudinal seam, and the cross or Galloway tubes are frequently welded in. He did not hear of any case of welding a boiler shell itself. Mr. Hale stated that corrugated flues were made in various ways and that while they were considered better in England, it was thought that most frequently the improvement did not warrant the expense. In comparing steam pressure it was found that for an American mill operating under 150 pounds pressure, the corresponding practice would be 200 pounds in England, 180 in Alsace, and 150 in Belgium and Germany.

Economizers were much more general in Europe than in American practice. One economizer was generally put in for each battery of boilers, making the heating surface the same as the heating surface in the boiler. He noted that in some plants where economizers had been taken out, the heating surface of the boilers had to be more than double to get the same economy. One advantage claimed for economizers and the Lancashire boilers was that the large amount of hot water in them offered a reserve of heat for a sudden call. Mr. Hale then described the Halpin system for heat storage, which has been previously mentioned in these columns.

The use of superheated steam is very much in the air all over England, and in Alsace it is fairly general, about 500 superheaters being in use. There never has been any doubt that they save from 10 to 20 per cent. of coal, but the difficulty has been, Mr. Hale said, in the lubrication of the engine cylinder and in keeping the joints of the superheater tight.

Regarding grates, the practice in Germany in the case of under-fired boilers, was to incline the grates downward to the rear as much as 18 inches, as it was thought to be easier for the firemen and to give better combustion.

The report states that several forms of economical stokers were in use in England, perhaps over one-fourth of the boilers being equipped. Mr. Hale divides the stokers into two classes, the coking and sprinkling stokers, the former type feeding the coal to the front, where it cokes and is then carried to the rear by the reciprocating motion of the grate bars. The sprinkling stokers throw the coal over the grate by means of revolving or oscillating shovels. Mr. Hale found stokers of the former type to be the best known. It is believed in England that no stoker absolutely prevented smoke, but that both types very largely diminished it, the coking stoker having the advantage in this respect. The opinion is divided as to the economy of stokers. The most general reason for their adoption was the diminution of smoke, the laws being very strict. They also permit of the use of a cheaper fuel, but Mr. Hale is inclined to believe that the net saving in this direction after paying the interest and repairs amounted to little or nothing. The use of stokers and coal-handling appliances together was thought to save about one-third of the boiler room labor in large plants.

In Germany grinding the coal to a powder and blowing this dust-coal mixed with air into a hot combustion chamber was a method that was being experimented upon in several plants and was meeting with considerable favor. The fine dust, however, was not only very dirty to handle, but exceedingly liable to spontaneous combustion, and the problem of grinding and storing it had not as yet been commercially solved.

Boiler fittings abroad were noticeably heavier and stronger than in America, and the use of a spring-loaded safety valve was looked upon with distrust. The average quality of the boiler and pipe coverings did not impress Mr. Hale as favorably as those in America. He had seen wood and even rope covering on high-pressure piping. In this respect Mr. Hale also calls attention to the wise practice of covering the top of boilers with a thick cheap covering to prevent the radiation of heat, this being generally done abroad.

In speaking of boiler operation Mr. Hale found that the surfaces of boilers were kept in a cleaner condition abroad than in this country. In some places they run the boiler until the specific gravity of the water is 1.005 and then they blow out and clean the boiler. In England they use soda lime, and potash in the boilers according to the impurities. In mills the fires are banked at night, while in electric stations the custom was very general to let the fires go out when they were not needed. Mr. Hale described this difference not to the fact that a mill fire is out of use for a less time (14 hours) than an electric station fire (16 hours), but to the fact that in the case of a mill the new fire must be started at, say 4 A.M., when it would involve an extra shift of men, whereas in electric stations the fire is needed at about 4 P.M. and involves no extra labor. From data given by several plants it was found that the cost of banking fires was about 40 pounds of coal per day per square foot of grate. The wages of the firemen are about $1.10 per day in England, 80 cents in France and Belgium, and 87 cents in Germany.

In regard to European boiler testing, Mr. Hale found the practice in some respects more advanced than it is with us, chiefly in that they attempt to tell where all the heat supplied goes to, and thus to determine the reasons of good or bad performances. The bomb calorimeter in one or the other of its various forms, Mahler's, Donkin's, etc., is con-

sidered the only accurate means of determining the heat value of a coal, though the method of analyzing coal and using one of the numerous modifications of Dulong's formula is quite often employed. The Thompson and other calorimeters of that type are not considered in the least available for practical work. It was the custom to correct the results of the calorimeter for the latent heat of the H_2O formed from the hydrogen in the coal, or, if using the formula, to assume that the hydrogen was burned to steam and not to water. Coal tests are compared on the evaporation per pound of coal, boiler tests were generally compared on the evaporation per pound of coal "pure and dry," dry referring of course to the moisture correction, pure to a correction of the earthy matter contained in the coal, but not allowing any correction for the unburned coal in the ashes. Occasionally, however, pure and dry meant exactly the same as our "combustible." In determining moisture in steam they are as far behind us in their general practice, with the exception of a few of their best engineers, as they are ahead of us in the analysis of the gases. Fortunately at the high steam pressures now in vogue the priming is generally a negligible quantity so that their results have not been affected.

In boiler economy I could not see that they were either ahead or behind us; they get from 60 to 80 per cent. of the heat in the coal according to the air supply and evaporation per square foot of heating surface. None of their engineers had ever found any combustible gases in the chimney except occasionally a little CO (carbonic oxide). Most of their tests, however, left some zero to 15 per cent. of the heat unaccounted for, which may be radiation or error. Some said one, some the other. No one had experimented as to why it is harder to supply the right amount of air to one kind of coal than to another, though they had all gone as far as to realize the immense importance of the air supply, as compared with any other factor in boiler economy, and also to realize and to experiment on the amount of air that leaks through the settings of some types of boilers to the injury of the economy. Frequently more air has been found to leak through the settings than came through the fire. In some plants on the Continent they were painting the brick settings with a heavy tar paint to make them airtight, and occasionally even inclosing them in sheet iron casings. In Germany they have an instrument called the gas balance which shows the per cent. of CO_2 in the flue gases on a dial like a steam gauge. If not too delicate it promises to be of great practical use.

The special instruments used for boiler testing, besides those above spoken of, were the ordinary thermometer for low flue temperatures, and for high temperatures the electric resistance pyrometer, in England; the thermo electric pyrometer used in Germany, and the mercury thermometer with compressed nitrogen or carbonic acid over the mercury, reading to 550° C. (about 1,000° F. English measure). For analyzing flue gases the Orsat apparatus is most commonly used. For getting the moisture in the steam the salt test is the usual one if the determination is made at all.

Appended to Mr. Hale's report is a paper by V. B. Lewes, F.I.C., F.C.S., upon the "Spontaneous Ignition of Coal and Its Prevention." After discussing the chemical and physical reasons which lead to the phenomenon, the paper urges the adherence to the following precaution to prevent disaster:

1. *The Choice of Coal for Storage or Shipment.*—The coal should be as large as possible, free from dust, and with as little "smalls" as can be helped. It is better as free from pyrites as possible, and it should contain, when air-dried, not more than 3 per cent. of moisture.

2. *Precautions to be Taken in Storing or Loading.*—The coal store should be well roofed in and have an iron floor bedded in cement; all supports passing through and in contact with the coal should be of iron or brick; if hollow iron supports are used, they should be cast solid with cement. The coal must never be loaded or stored during wet weather, and the depth of coal in the store should not exceed 8 feet and should only be 6 feet where possible. Under no condition must a steam or exhaust pipe or flue be allowed in or near any wall of the store, nor must the store be within 20 feet of any boiler, furnace or bench of retorts. No coal should be stored or shipped to distant ports until at least a month has elapsed since it was brought to the surface. Every care should be taken during the loading or storage to prevent breaking or crushing of the coal, and on no account must a large accumulation of small coal be allowed. These precautions, if properly carried out, would amply suffice to entirely do away with spontaneous ignition in stored coal on hand.

MR. ALEX. C. HUMPHREYS is home again, after a brief European trip. He reports business on the "other side" as very brisk in the gas line. He says that he is well, and he certainly looks it.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE annual meeting of the shareholders in the Brookline (Mass.) Gas Light Company, which was set for the 23d inst., was adjourned for 30 days, on account of the lack of a quorum. The annual report of the Directors shows a large increase in gas sales.

ACCORDING to the report of Mr. Herbert M. Hill, City Chemist of Buffalo, N.Y., as the result of instructions to him from the Buffalo Department of Public Works to test the quality of the gas supplied to the city by the local Gas Companies, the Chemist found the following: Gas supplied by the Mutual Gas Company—candle power, at 5 cubic feet per hour, 21.56; sulphur, per 100 cubic feet, 5.26 grains; ammonia, per 100 cubic feet, 6.81 grains; hydrogen sulphide, none. Gas supplied by the Buffalo Gas Light Company—candle power, at 5 cubic feet per hour, 18.84; sulphur, per 100 cubic feet, 7.34 grains; ammonia, per 100 cubic feet, 7.33 grains; hydrogen sulphide, none. Gas supplied by the Citizens Gas Company—candle power, at 5 cubic feet per hour, 18.47; sulphur, per 100 cubic feet, 7.66 grains; ammonia, per 100 cubic feet, 12.44; hydrogen sulphide, none.

ON September 25th the case of the East Chester Gas Company, of Mount Vernon, N. Y., against the authorities (the question in dispute being over the validity of the ordinance passed some time ago, which directs that the Gas Company must make application to a designated local authority each time that it desires to open the streets), was argued before Judge Schatz. Judge I. N. Mills represented the Company, and the city's case was upheld by Corporation Counsel Davits. The Judge ordered counsel to submit briefs. The main contention by the Company was that its charter afforded it the necessary rights in the premises.

AT the annual meeting of the Amherst (Mass.) Gas and Electric Light Company the following officers were elected: Directors, Henry Adams, C. H. Fernald, M. A. Dickinson, L. M. Hills, C. Deuel, Frederick Tuckerman and E. D. March; Secretary and Treasurer, Charles Deuel. The annual reports showed that the Company's business for the year was in all respects satisfactory. It was also determined to increase the power plant of the electric light station by the placing of a boiler up to 125-horse power.

A CORRESPONDENT at Ottawa, Canada, forwards the following: "Perhaps the neatest, certainly the most enticing and comfortable exhibit in the main building, devoted to the purposes of the Ottawa Fair, is that of the Ottawa Gas Company. It consists of three compartments, all arched with bunting, flags and evergreens, the interiors being prettily decorated with those trifles that go to make harmony. In two of the compartments are shown an extensive collection of gas heaters, grates, stoves, radiators, instantaneous water heaters and gas ranges of many varieties. The third compartment is fitted up to represent a drawing room, and is the cosiest little corner on the grounds. The walls are prettily papered and are hung with handsome pictures. The floor is carpeted and rugged. A very fine mantelpiece and gas grate handsomely tiled occupy the center of the room, and in the grate glowing asbestos trembles with the warming gas flames—the heat which radiates therefrom being quite grateful these cool days. The mantel is decorated with statuary and bric-a-brac, and sea shells are strewn upon the tiles. A bevelled mirror is let into the mantel and tends further to beautify the place. The Company's display is visited by all who enter the grounds, and the gentleman in charge of it (Secretary and Treasurer George P. Spittal) cannot be too highly complimented upon the clever way in which he arranged the exhibit."

THE case of the Glens Falls Gas Light Company, of Glens Falls, N. Y.; against Messrs. Benjamin Van Vranken and James Duell, contractors, on appeal to the Appellate Division of the Supreme Court, was argued recently. The action was brought to recover $4,000 for damages sustained by the Gas Company to its mains through the negligence of defendants while constructing a system of sewers for the village of Glens Falls. Messrs. Potter & Kellogg have the management of the case for the Company.

THE California Safe Deposit and Trust Company has filed a mortgage given to it by the Sacramento (Cal.) Electric, Gas and Railway Company to secure the payment of $2,000,000. The mortgage, which is to run for 30 years, and which bears interest at the rate of 6 per cent., is merely an issue of new bonds to cover the bonds outstanding on the properties of the concerns which have been merged under the title above named.

THE block of new stock (1,595 shares) unsubscribed for by the shareholders of the Fall River (Mass.) Gas Works Company, which stock was offered at public auction, in Boston, on September 26th, was nominally purchased by the Mercantile Loan and Trust Company at its bid of par.

MR. HORATIO N. BEACH, a prominent resident of Brockport, N. Y., from the time of his settling there in 1856, died at his home in that city on the night of September 21st. Deceased, who was in his 71st year, was one of the organizers of the Brockport Gas Company, the charter for which was issued in 1859.

A CORRESPONDENT forwards the following: "Samuel Shaw, in behalf of himself and other creditors of the Citizens Gas Light Company, of Reading, South Reading and Stoneham, Mass., recently petitioned the Supreme Judicial Court that a receiver be appointed to take possession of all the property, rights, interests, privileges and franchises of the corporation, to manage and control the same under the direction of said Court and carry on the business for the benefit of the petitioner and all other creditors and parties interested therein. The Wakefield portion of this Company's franchise was bought out some time ago by the town of Wakefield, and the Company's headquarters are now in Stoneham. Mr. Shaw's petition sets forth that in July last the Smith & Winchester Company, of Boston, recovered judgment against the Gas Company for Shaw's use and benefit, upon which execution was issued and demand made for payment, but the corporation failed to comply with such demand; that the corporation conveyed all its franchise and property in Stoneham to the United States Trust Company, in Boston, in trust to secure an issue of bonds amounting to $50,000, and afterwards (Feb. 25, 1896), by mortgage deed conveyed all the balance of its property, situated in Reading, to W. B. Littlefield, to secure a sum of $5,000; that the records of these transactions at Cambridge, in the registry of deeds, disclose the following attachments: C. F. Hathaway, $5,000; C. S. Waldo, $500; Pittsfield National Bank, $5,000; Town of Wakefield, $2,000; H. Hornblower, $4,000; Belknap Savings Bank, $2,000, and J. Phillips, $1,000; that the respondent Company has now no property which can be levied upon except that which is covered by these attachments, and payment cannot, therefore, be enforced on the petitioners' judgment by seizure and sale on execution, but that if the property is placed in the hands of a receiver and held together and properly used there will be a surplus for payment of respondent's debts. The petitioner further sets forth that the affairs of the Company have been so badly managed by its officers as to endanger the property, rights and interest of all the creditors and stockholders."

IN connection with the above the following notice, issued by the town of Wakefield, through its Municipal Light Board, to the customers of the Citizens Company residing in Reading, will be of interest: "You are hereby notified that the Citizens Gas Light Company, of Reading, South Reading and Stoneham has made an assignment to the town of Wakefield of all the sums now due it for gas, and that you are required to make payment of such sums to the Municipal Light Board of Wakefield."

CHARLES A. LINK, an undertaker, was recently convicted of making a connection with the mains of the Columbus (O.) Gas Company with intent to defraud the Company. In fact, Link pleaded guilty to the charge, for he knew that the evidence of his guilt that had been collected by Secretary Lathrop was so convincing as to leave him no ground for quibbling. The Judge lectured the culprit in round terms, and then imposed a fine of $10 and costs.

THE Committee on Street Lights of the Milwaukee (Wis.) Common Council has recommended the acceptance of the Milwaukee Gas Company's proposition to light the public gas lamps for a period of five years, on the basis of payment of $20 per lamp per annum. The city now pays $22 per lamp.

MESSRS. Philo D. Beard and William F. Newland, who sign themselves as Directors of the named concern, are responsible for the publication in the newspapers of Buffalo, N. Y., of an advertisement to the effect that a special meeting of the stockholders of the Queen City Gas Light Company, of Buffalo, will be held at the office of said Company, in the Erie County Savings Bank, at 11 A.M. of October 7th. The meeting is called for the purpose of determining the following propositions: Whether the capital stock shall be increased from $50,000 to $500,000, and whether the number of Directors shall be increased from 3 to 7.

UP to September 21st the Kentucky State Board of Valuation had determined upon the following as the amounts upon which the named Companies were to be assessed for purposes of franchise taxation—the Board is composed of the State Auditor, Secretary of State and State Treasurer:

Name of Company.	Assessed Value.
Bellevue Water and Fuel Gas Light Company...	$36,690
Bowling Green Gas Light Company	23,666
Capital Gas and Electric Light Co.—Frankfort..	60,357
Covington Gas Light Company.....	366,790
Danville Gas Light Company.....	22,472
Hopkinsville Gas and Lighting Company.....	500
Kentucky Heating Company—Louisville.....	96,480
Louisville Gas Company	2,752,841
Maysville Gas Company	18,410
Newport Light Company.....	39,567
Paducah Gas Light Company.	93,995
Paris Gas Company	13,000
Richmond Water and Light Company	16,666

MR. MILO M. ACKER, who has been acting as Receiver for the concern that constructed the fuel gas plant at Canisteo, N. Y., has sold the property for a sum something under $8,000. We understand that the works will be reconstructed.

THE Middletown (O.) Gas Light Company has been put in the hands of Mr. Chas. S. Barnitz, as receiver. The assignment was brought through the action of the Hanover (Pa.) Savings Fund Society, which is said to hold a large block of bonds of the Company.

AN interesting case was argued some days ago before the Court of Queen's Bench, Montreal, Can., in which the parties in conflict were the Montreal Gas Company (defendant in Court below), appellant, and M. Cadieux (plaintiff in Court below), respondent. The appeal was from a judgment of the Superior Court, rendered on the 4th of May last, which ordered the issue of a writ of mandamus enjoining the appellant to furnish gas to the respondent for lighting and heating at his residence, No. 282 St. Charles Borromeo street, Montreal. The respondent alleged that he resides at 282 St. Charles Borromeo street; that for a number of years he had been using appellant's gas to light his residence and for use in kitchen, and that he had paid all he owed; that on the 5th of December last the Company appellant disconnected its gas pipes from those of respondent's residence. The respondent alleged that the appellant, under its charter, was bound to furnish the gas necessary for lighting and heating, and he asked that a writ of mandamus should issue enjoining the appellant to furnish respondent, on same conditions as heretofore, the gas necessary for lighting and heating. The appellant pleaded, alleging that it had furnished respondent with gas at No. 282 St. Charles Borromeo street, and also at No. 1125 Notre Dame street, under arrangements by which respondent might cease to use gas on 24 hours' notice, and appellant might cease to furnish it on the same notice; that respondent had not paid for all the gas furnished to him, and that the appellant had ceased to furnish gas under the rights which it possessed by its charter. Respondent answered that he had paid for all the gas furnished to his residence, 282 St. Charles Borromeo street, and that he was only surety for the gas furnished to 1125 Notre Dame street. The Court below held that the Company appellant was bound to furnish any resident in the city of Montreal with the gas required for lighting and heating his residence on condition that he paid the price stipulated. It was proved that the respondent owed nothing to appellant for the gas furnished by it for respondent's residence, and appellant was bound to furnish gas for the residence, and could not refuse on the ground that respondent was indebted to the Company as surety for the gas furnished by it to another house. The higher Court took the papers and reserved decision.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Mr. Enright's Experience with Acetylene Gas.

OFFICE OF MERIDIAN GAS LIGHT COMPANY,
MERIDIAN, MISS., Sept. 26, 1896.

To the Editor AMERICAN GAS LIGHT JOURNAL: The acetylene gas generator, patented in May, 1896, by some residents of Minneapolis, Minn., the State rights for which have been on sale for some time, was brought to the attention of our residents some weeks ago; and, of

course, it is almost needless to say I availed myself of the first opportunity to see and examine what some people choose to call one of the wonders of the century. The generator was located in a storeroom, 20 feet by 40 feet, and I found the agent to be a very social and agreeable gentleman, ready at all times to furnish the curious with any desired information regarding the "little generator" in particular and acetylene in general. In answer to questions as to the cost of carbide per ton, yield per pound, amount consumed per burner per hour, candle power and percentage of loss through condensation, and pressure from generator, he gave the yield as 5.8 cubic feet per pound; the burners consumed 7-8ths cubic foot per hour, and the candle power was from 70 to 100. The loss from condensation he could not state, neither could he give the pressure caused by generator when in action. I then inquired as to the cost of the gas, compared to coal gas or water gas, and was informed that it was much cheaper than either, owing to the fact that 1 cubic foot of acetylene gas gave 5 times the light emitted by the combustion of 6 feet of coal or water gas. He acknowledged that the cost of the carbide was $100 per ton.

In reply to a question concerning the percentage of residuum, he said that was very small. During this time the little generator was in action, and the five burners in use lighted up the room very handsomely. Then, with a few parting remarks I left for home, wondering what rule of mathematics these people had at their disposal which would support their statements. Let me attempt here to describe the generator. Imagine two meter provers connected together with a ¾-inch pipe, the pipe entering the bottom of each and rising a few inches above the water line of the center of each prover, the same to act as an inlet or outlet from the holders, as the occasion or safety might demand, care being taken to have a drip pot connected on the low point of the pipe, to permit of the easy removal of condensation, etc. Now insert another ¾-inch pipe in the bottom of the prover selected for the receiver, to act as an outlet for your gas to the burners that are to be supplied. The other receiver can be transformed into a generator by cutting a hole in the top of the drum, 6½ inches in diameter, and inserting a cylinder 1 foot long and 6 inches in diameter, the bottom of same to be opened or closed at will by means of a cap or lid attached to a spring lever, the handle of same projecting from the top of drum. The top opening is closed in the same way, and made tight by means of a clamp and screw. Then place a wire screen over the entire bottom, on the inside of drum, about 1 foot up in the drum from its lower edge, to act as a repository or resting place for the carbide, when the latter is dropped out of the little cylinder into the water, care being taken to attach three small travelling chains, at equal distances apart, on the top of each holder, the chains to be of same length as holder and fastened to sides of provers, same to be taken up or shortened in the hooks, according to depth of seals that you would be compelled to maintain to guarantee safety from leakage caused by the breaking of seals. Now, we are well aware of the fact that every new scheme or invention created to make trouble for the gas industry never fails to capture the public fancy and sympathy in short order; and this instance proved no exception to the rule, for it was not long until a Company was formed for the purpose of buying the acetylene rights for the State of Mississippi. In this Company were a few friends of mine, who desired I should furnish them with some information respecting the merits of the property they proposed to exploit. I expressed my willingness to investigate the system, provided they would secure the agent's consent to permit me to experiment with the apparatus on my own account. They secured the necessary consent, my handling of the apparatus to last an hour.

I selected the hour from 7 to 8 one evening, stipulating that the apparatus should be absolutely clear of carbide or the gas therefrom. I placed an accurate meter on the outlet, leaving in line the five burners used by the agent, each said to consume 7-8ths foot of acetylene gas per hour, and weighed out 2 pounds of carbide, charging the generator with same. The gas was immediately on hand. I lighted all the burners, and found, after waiting an hour for the charge to exhaust, that exactly 10 cubic feet of gas had been made, or a yield of 5 cubic feet to the pound of carbide. I then disconnected the meter and placed an accurate burner tester on the outlet of the generator, attaching one of the 7-8th foot burners on the outlet of tester, recharged the generator and found that the burner consumed 2 cubic feet per hour.

The pressure from generator while in action was exactly 30-10ths; and the residuum from the carbide was shown to be at least 10 per cent. The loss through condensation could not be determined in so short a space of time and with so small a quantity of gas; nor could I accurately determine the candle power; but I feel safe in saying that it was about 60. On the succeeding night I put 5 Welsbach burners in the same place, each consuming 2 cubic feet per hour of 20-candle coal gas, keeping them alight one hour. In that time they consumed 10 cubic feet of 20-candle coal gas and developed a light of 60-candle power. All of the gentlemen in whose interest the experiment was made fully admitted that the room was better lighted by the Welsbachs than it was when acetylene gas was used. Now, for the cost of acetylene gas, manufactured in the way noted, with calcium carbide at $100 per ton, or 5 cents per pound (the agent's figures), as compared with 20-candle coal gas, at $2 per 1,000 cubic feet:

	Carb. Calc.	Gas Made.	Burners in Use.	Consumed per Burner per Hour.	Time.	C. P.	Cost.
Acetylene gas....	2 lbs.	10 cu. ft.	5	2 cu. ft.	1 hr.	60	10c.
Coal gas, Welsbach burners...	—	—	5	2 "	1 "	60	2c.

You will also notice that carbide sold at $100 per ton, as given by the agent to be the cost of same, and yielding 5 cubic feet to the pound, the cost of acetylene gas generated in this manner would be exactly $10 per 1,000 cubic feet, or just 5 times the cost of coal or water gas at $2 per 1,000, with lighting results precisely similar. The above figures also show that carbide would have to be sold at $20 net per ton, to allow acetylene gas manufactured in this way to compete on equal terms with coal or water gas at $2 per 1,000. These facts having been fully demonstrated to the party of gentlemen interested, it is almost useless to say that the rights for Mississippi are still for sale. Now, almost the first question that any gas engineer would ask, would be as to the danger connected with this machine or generator, if placed in the basement of a hotel, opera house, store or dwelling. Of course it is represented as being perfectly safe and harmless, and that it can be operated by the hostler, bell boy, cook or watchman; but, for argument's sake, I would like to know what the result would be if the cook went down in a hurry and charged the generator with 10 pounds, when 5 pounds would be ample for the night's consumption of gas in your dwelling or business place? The agent stated that such a condition is provided for by the fact that, when the receiving holder is expanded to the full extent of its chain limit, the pressure will force the generator holder up to the extent of raising the wire basket or screen out of the water, and thereby stop the further evolution of gas. This I know to be true; but what is to be done with the gas that constantly arises from the water in the generator strongly charged with the products of this material? How long would it take to break your seals by forcing the water out of the generator, thus permitting the gas to escape into the building? I also observe that acetylene gas generated by immersing the carbide in clean water will not develop one-third the candle power compared with gas generated in water highly charged with the product or chemicals of same. In conclusion, permit me to state that I do not desire to be considered as authority on the merits or demerits of acetylene gas. It is certainly a very interesting study, and it may at some time in the distant future be a very valuable enriching agent for coal gas.

Very truly yours, J. H. ENRIGHT.

Consumption of Petroleum for Fuel.

The *Scientific American* says that no official figures on the consumption of petroleum for fuel have been published since the statement presented in the columns of the *Shipping and Commercial List* on January 17, 1894. Then it was shown that the Ohio and Indiana oil fields had furnished for fuel purposes 7,000,000 barrels crude in 1890, a trifle over 9,500,000 in 1891, about 11,000,000 in 1892, and 9,000,000 in 1893. The consumption dropped to 8,000,000 barrels in 1891, and last year the total sales of fuel were 7,600,000 barrels. Since January 1 the movement of crude for that purpose has continued at about the same ratio. The decline is owing to reduced production and higher prices. In 1892, when consumption was at its highest point and producers were pushing the use of oil for fuel, the cost of Lima oil at the wells was 15 cents per barrel, in comparison with 72 cents as the average last year. The decreased yield of Pennsylvania crude compelled refiners to give more consideration to the so-called Lima oil. By improved processes they brought the Ohio refined to perfection, and it is now as acceptable for export as any other grade of petroleum. For that reason much less crude is used for fuel, and unless production should largely increase, the volume of business in fuel oil will continue to decrease, so far as the Ohio and Indiana fields are concerned.

A different story comes from California, where the production last year was 800,000 barrels, against 400,000 in 1894, half of which was

(*Continued on page* 535.)

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

EDITOR—Jos. R. Thomas, C.E.
ASST. EDITOR—T. J. Cunningham.
MANAGER—C. E. Sanderson.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 32 Pine Street, New York.

The JOURNAL is the official organ of the
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
AMERICAN GAS LIGHT ASSOCIATION.
WESTERN GAS ASSOCIATION.
OHIO GAS LIGHT ASSOCIATION.
PACIFIC COAST GAS ASSOCIATION.
TEXAS GAS AND ELECTRIC LIGHT ASSOCIATION.

TERMS:
SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 Cents.

AGENTS:
New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, OCT. 5, 1896.

(*Continued from page* 534.)

used for fuel and the balance refined. Developments are rapidly increasing the oil wealth of that State, and until the oil is otherwise used great efforts are being made to push it forward as a fuel. It is now being used in locomotives with success, this feature being taken from Russia. The comparatively new fuel is meeting with favor on the Pacific Coast, as it cheapens the cost materially to many industries and prevents a surplus.

Another Petroleum Gas Machine.

The *Journal of Gas Lighting* notes that *Industries* not long ago referred to a "revolutionary" system of gas lighting that is now being introduced to the public. The invention is of German origin, being owned by the proprietors of the Dürr light. The gas is a petroleum gas, manufactured from the oil in a producer. It is asserted that an illuminating gas, quite equal in photometric quality to the best existing standard, can be supplied through mains at a cost of less than 25 cents per 1,000 cubic feet; also, that an installation, equal to 100 lights, can be laid down for an inclusive expense of about $150. Of course, this sum would relate to the generating plant only; the mains and connections would probably cost much more. The apparatus looks simple—consisting of a small hot-air motor, one or two mixing chambers, an oil tank, etc., and that is all. For use with the incandescent mantle, the gas is said to be excellent, giving with the Welsbach mantle a light of 64 to 65 candles.

Gas Engines for Ships.

Ships with gas engines are apparently gaining favor in France. A new boat of this type has recently been put in service for the Havre-Rouen-Paris line, the speed attained being 7 knots. It is 100 ft. long, with 7 ft. draught, divided into four water-tight compartments. The gas is supplied from on shore, and is stored on board in a steel holder, an accumulator composed of steel pipes, under a pressure of 95 atmospheres, about 850 lbs. The engine employed is a 2-cylinder one, of 40-horse power.

The Market for Gas Securities.

A better feeling prevails all round in gas shares, and the market at this writing is fairly active. Consolidated sold above 149 during the week, and the opening to-day (Friday) in it was made at 148½ to 150. This is very much more like a value for it, although it is still 10 points or more below where it should be, if real value is to be considered. New York and East River common moved up to 35 bid, and Standard common also advanced a point, to 80 bid, holders asking 82. Mutual and Equitable are also in demand.

Brooklyn Union bonds are quite strong, many sales having been effected therein at 105, which figure is still on offer. The stock also advanced 2 points in the bid price this week. Consolidated, of Baltimore, is very active at an advance of 2 points, and Chicago gas is strong. The posted believe that the dividend on Chicago will not be much longer delayed. Bay State is down to 13 bid and Lacledes are steady. San Francisco gas has scored an advance of 6 points on the certainty that all obstacles to the amalgamation with the local Edison Company have been removed. The general situation points to higher prices.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks,
35 WALL ST., NEW YORK CITY.
OCT. 5.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	148½	150
Central	500,000	50	150	..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	197	204
Bonds, 6's	1,000,000	1,000	105	.
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	215	225
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
Northern	150,000	50	79	80½
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	35	36
Preferred	2,000,000	100	60	70
Bonds 1st 5's	3,500,000	1,000	101	103
" 1st Con. 5's	1,500,000	..	86	88
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	80	82
Preferred	5,000,000	100	105	..
Bonds, 1st Mortgage, 5's	1,500,000	1,000	107	111
Yonkers	299,650	50	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	80	93
" " Bonds (5's)	15,000,000	1,000	105	..
Bay State	5,000,000	50	13	13½
" Income Bonds	2,000,000	1,000	27	30
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	76	73
2d " " "	3,000,000	1,000	60	65
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	93	..
Chicago Gas Co.	25,000,000	100	62⅜	62¾
Chicago Gas Lt. & Coke Co. Guaranteed Gold Bonds.	7,650,000	1,000	94	94¼
Columbus	1,069,000	..	..	65
1st Mortgage	1,085,000	..	..	96
Consumers. Jersey City	2,000,000	100	60	75
" Bonds	600,000	1,000	97	101
Cincinnati G. & C. Co.	7,000,000	100	153	155
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	30
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	1,000,000	100	62½	63¾
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000	..	32	33
" Con. Bonds	4,312,000	..	..	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	78	83
" Bonds	2,000,000	..	85	90
Hartford	750,000	25	..	14
Indianapolis	2,000,000	..	115	130
" Bonds, 6's	2,650,000	..	99½	101½
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	..	90
Bonds	1,000,000	1,000	85	90
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	24¾	25½
Preferred	2,500,000	100	78	80
Bonds	9,034,400	1,000	92	93
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co.	1,000,000	..	93	98
Bonds, 6's	4,000,000	..	123	..
New Haven	1,000,000	25	225	..
Oakland, Cal.	2,000,000	..	52	53¼
" Bonds	750,000	..	..	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	2,100,000	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Paterson, N. J.	.....	25	99	102
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	83	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	93¾	93¼
St. Paul Gas Light Co.	1,500,000	100	67½	70
1st Mortgage, 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	.	88	90
Syracuse, N. Y.	500,000	25	..	..
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	53	58
Bonds, 5's	3,556,000	.	80	85
Wilmington, Del.	500,000	50	180	182

Advertisers' Index.

GAS ENGINEERS.

	Page
Jos. R. Thomas, New York City	557
Wm. Henry White, New York City	555
Fred. Bredel, Milwaukee, Wis.	540
Geo. R. Rowland, New York City	555
The Western Gas Construction Co., Fort Wayne, Ind.	546
Humphreys & Glasgow, New York City	542
T. G. Lansden, St. Louis, Mo.	555
American Gas Co., Phila., Pa.	540
David Leavitt Hough, New York City	557

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md.	553
United Gas Improvement Co., Phila., Pa.	545
Burdett Loomis, Hartford, Conn.	554
National Gas and Water Co., Chicago, Ills.	547
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	553
The Western Gas Construction Co., Fort Wayne, Ind.	546

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City	556
Continental Iron Works, Brooklyn, N. Y.	554
Deily & Fowler, Phila., Pa.	556
Kerr Murray Mfg. Co., Fort Wayne, Ind.	552
Stacey Mfg. Co., Cincinnati, Ohio.	555
Bartlett, Hayward & Co., Baltimore, Md.	553
Davis and Farnum Mfg. Co., Waltham, Mass.	552
R. D. Wood & Co., Phila., Pa.	554
Isbell-Porter Company, New York City	554
Fred. Bredel, Milwaukee, Wis.	540
United Gas Improvement Co., Phila., Pa.	545
Berlin Iron Bridge Co., East Berlin, Conn.	542
National Gas and Water Co., Chicago, Ills.	547
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	553
The Western Gas Construction Co., Fort Wayne, Ind.	546
Humphreys & Glasgow, New York City	542
Gas Engineering Co., Pittsburgh, Pa.	552
American Gas Co., Phila., Pa.	540

SCRUBBERS AND CONDENSERS.

G. Shepard Page's Sons, New York City..... 555
R. D. Wood & Co., Phila., Pa..... 554
James R. Floyd & Sons, New York City..... 556
Continental Iron Works, Brooklyn, N. Y..... 554
Gas Engineering Co., Pittsburgh, Pa..... 552

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md..... 553
Fred. Bredel, Milwaukee, Wis..... 540
J. H. Gautier & Co., Jersey City, N. J..... 550
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 550
Adam Weber New York City..... 550

TAR AND CARBONIC ACID EXTRACTOR.

G. Shepard Page's Sons, New York City..... 555

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich..... 536
G. Shepard Page's Sons, New York City..... 555
Gas Engineering Co., Pittsburgh, Pa..... 552

GAS METERS.

John J. Griffin & Co., Phila., Pa..... 560
American Meter Co., New York and Philadelphia..... 559
The Goodwin Meter Co., Phila., Pa..... 558
Helme & McIlhenny, Phila., Pa..... 559
D. McDonald & Co., Albany, N.Y..... 559
Nathaniel Tufts, Boston, Mass..... 558
Maryland Meter and Mfg. Co. Baltimore, Md..... 558
Metric Metal Co., Erie, Pa..... 558
Keystone Meter Co., Royersford, Pa..... 538
Buhl Stamping Company, Detroit, Mich..... 559

PREPAYMENT METERS.

American Meter Co.. New York and Philadelphia..... 559
John J. Griffin & Co., Phila., Pa..... 560
D. McDonald & Co., Albany, N. Y..... 559
Helme & McIlhenny, Phila., Pa..... 559

GAS AND WATER PIPES.

Ohio Pipe Co., Columbus, Ohio..... 557
M. J. Drummond, New York City..... 557
R. D. Wood & Co., Phila., Pa..... 554
Warren Foundry and Machine Co., New York City..... 557
Donaldson Iron Co., Emaus, Pa..... 557
Addyston Pipe and Steel Co., Cincinnati, O..... 557

PIPE CUTTERS.

Wm. Anderson, East Boston, Mass..... 537

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, New York City..... 557

GAS COALS.

Penn Gas Coal Co., Phila., Pa..... 549
Perkins & Co., New York City..... 548
Despard Gas Coal Co., Baltimore, Md..... 549
Westmoreland Coal Co., Phila., Pa..... 549
Berwind-White Coal Mining Co., New York and Phila... 548

CANNEL COALS.

Perkins & Co., New York City..... 548

GAS ENRICHERS.

Standard Oil Co., New York City..... 549
The Sun Oil Co., Pittsburgh, Pa..... 549

COKE CRUSHER.

C. M. Keller, Columbus, Ind..... 549

CONVEYING MACHINERY.

C. W. Hunt Company, N. Y. City..... 538

GAS GAUGES.

The Bristol Co., Waterbury, Conn..... 537

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City. 547
Isbell-Porter Co., New York City..... 554
The Wilder Mfg. Co. Phila., Pa..... 533

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Company, New York City..... 554
Continental Iron Works, Brooklyn, N. Y..... 554
G. Shepard Page's Sons, New York City..... 555

CEMENTS.

C. L. Gerould & Co., Mount Vernon, N. Y..... 550

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J..... 550
B. Kreischer & Sons, New York City..... 550
Adam Weber, New York City..... 550
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 550
Cyrus Borgner, Phila., Pa..... 550
James Gardner, Jr., Pittsburgh, Pa..... 550
Henry Maurer & Son, New York City..... 550
Baltimore Retort and Firebrick Co., Baltimore, Md..... 550
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 550
Brooklyn Firebrick Works, Brooklyn, N. Y..... 550

INCANDESCENT GAS LAMPS.

Welsbach Commercial Co., Phila., Pa..... 539

MICA GOODS.

The Mica Mfg. Co., New York City..... 537

BURNERS.

C. A. Gefrorer, Phila., Pa..... 554

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn..... 536

GAS TUBING.

Wm. M. Crane & Co., New York City..... 541

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 547
Greenpoint Chemical Works, Brooklyn, N. Y..... 547
Henry W. Douglas, Ann Arbor, Mich..... 547

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind..... 544
Isbell-Porter Company, New York City..... 554
Connelly Iron Sponge and Governor Co., New York City 547

VALVES.

Tudlow Valve Manufacturing Co., Troy, N.Y..... 546
Chapman Valve Manufacturing Co., Boston, Mass..... 546
R. D. Wood & Co., Phila., Pa..... 554
Continental Iron Works, Brooklyn, N. Y..... 554
The P. H. & F. M. Roots Co., Connersville, Ind..... 544
Isbell-Porter Co., New York City..... 554
The Western Gas Construction Co., Fort Wayne, Ind.... 546

ELECTRICAL APPARATUS.

Wm. Henry White, New York City..... 555

GAS ENGINES.

Otto Gas Engine Works, Phila., Pa..... 520
The American Gas Engine Co., Phila., Pa..... 551
Backus Water Motor Co., Newark, N. J..... 497

ENGINES AND BOILERS.

The Hazelton Boiler Company, New York City..... 537
W. G. & G. Greenfield, East Newark, N. J..... 497

PURIFIER SCREENS.

John Cabot, New York City..... 536

GAS STOVES.

American Meter Co., New York and Philadelphia..... 543
The Goodwin Meter Co., Phila., Pa..... 558
George M. Clark & Co., Chicago, Ills..... 541
Maryland Meter and Manufacturing Co., Baltimore, Md. 558
William M. Crane & Co., New York City..... 541
Keystone Meter Co., Royersford, Pa..... 538
A. Weiskittel & Son, Baltimore, Md..... 537

CHINA GAS KILNS.

William M. Crane & Co., New York City..... 541

GASHOLDER PAINT.

New York Marine Paint Co., Poughkeepsie, N.Y..... 546

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N. Y..... 546

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md..... 553
Continental Iron Works, Brooklyn, N. Y..... 554
Deily & Fowler, Philadelphia, Pa..... 556
Davis & Farnum Mfg. Co., Waltham, Mass..... 552
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 552
Stacey Mfg. Co., Cincinnati, Ohio..... 555
R. D. Wood & Co., Philadelphia, Pa..... 554

BOOKS, ETC.

Scientific Books..... 556
Field's Analysis..... 548
Digest of Gas Cases..... 549
Directory of Gas Companies..... 557
Practical Photometry..... 550
Coal Tar Genealogical Tree..... 548
Management of Small Gas Works..... 542
Handbook on Gas Engines..... 557
Gas Flow Computers..... 538
Hughes' "Gas Works"..... 537

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., DREXEL BUILDING, PHILA., Sept. 24, 1896.

The Directors have declared a quarterly dividend of 2 per cent. ($1 per share), payable on Oct. 15, 1896, to stockholders of record at the close of business Sept. 30. Checks will be mailed.

1112-3 EDWARD C. LEE, Treas.

Agency Wanted.

Young man well acquainted with Gas Companies would like to represent, in the territory east of Pittsburgh, Pa., and Buffalo, N. Y., with headquarters in New York City, a concern dealing with Gas Companies. Desires to connect himself with party who has now, or can offer, opportunity for developing a large business. Can furnish best of reference.

1113-2 Address "M. N. T.," care this Journal.

WANTED,

Position as Superintendent of Gas Works,

by a capable, energetic and economical manager. Over five years with present Company. Good reasons for desiring a change. Address

1102-tf "H. G. E.," care this Journal.

Position Desired

As Superintendent of Gas Works or Gas and Electric Light Works,

By a man 34 years of age. Sixteen years' experience in the manufacture and distribution of Coal Gas as Supt., and four years in the Electric line. Thoroughly competent to take charge of any plant, separately or combined. A practical mechanic, and understands the erection of gas plants and everything pertaining to the business. Not afraid of work. Salary no object until ability is proven. Best of references.

1102-tf Address "M. E. J.," care this Journal.

For Sale.

A Small Gas and Electric Light Plant,

in a Southern city of 3,800 inhabitants.

Address FORT WAYNE ELECTRIC CORPORATION,

1097-tf Fort Wayne, Ind.

Utilize Your Gas Liquor.

NO EXTRA LABOR OR OPERATING EXPENSES.

Ammonia Concentrator.

Not Expensive. Write to

STROH & OSIUS, Pat'ees, or Mich. Ammonia Works, Detroit, Mich.

Patent Lava Gas Tips.

UNIFORMITY GUARANTEED.

ALL SIZES AND SHAPES.

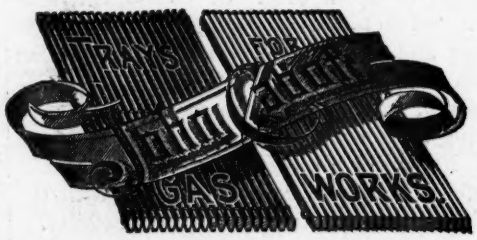
D. M. STEWARD MFG. CO.,

CHATTANOOGA, TENN.

Special Trays for Iron Sponge or Oxide of Iron.

CHURCH'S TRAYS a Specialty.

Reversible, Strongest, Most Durable, Most Easily Repaired.

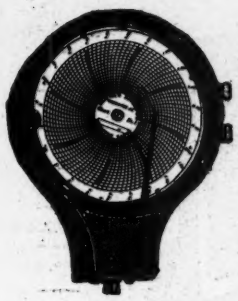


306-310 Eleventh Avenue, New York.

We also make the Cheapest and Strongest REVERSIBLE BOLTED TRAYS IN THE MARKET.

Send for Circulars.

BRISTOL'S RECORDING **PRESSURE GAUGE**



For Continuous Records of

Street Gas Pressure.

Simple in Construction,
Accurate in Operation,
Low in Price,
Fully Guaranteed.

Send for Circulars.

THE BRISTOL CO.
Waterbury, Conn.

Received Medal at World's Columbian Exposition.

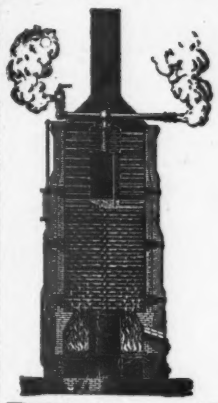
THE ANDERSON Patent Cutter Carrying Link
Made in all sizes.

Will cut from 2 in. to 24 in.
Pipe Cutting Tool

For Cutting Cast, Wrought Iron, Gas & Water Pipes.

WM. ANDERSON,
425 Meridian Street,
East Boston, Mass., or
WALDO BROS.,
88 Water Street, Boston, Mass.

The Pioneer Vertical Water-Tube Boiler of the World!



THE HAZELTON OR PORCUPINE BOILER.

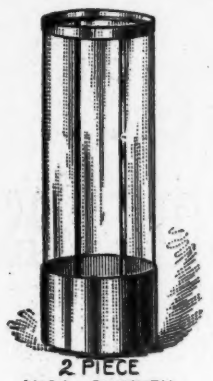
After Sixteen Years of Active Service in all the Principal Industries, this Boiler has Proven Itself Superior to all Others in Economy of Fuel, Durability, Safety and General Efficiency.

NO EXPLOSIONS OR ACCIDENTS OF ANY KIND.

Correspondence Solicited.

The HAZELTON BOILER COMPANY,
Sole Proprietors and Manufacturers,
Cable Address, "Palla," New York.
Tele., "1229-18th St.," New York.
Gen'l Office, 716 E. 13th St., N.Y., U.S.A.

Our Mica Chimneys



2 PIECE MICA CHIMNEY.

Etched Chimneys to Order.

For Welsbach Lights
ARE THE
BEST IN THE WORLD.

Get Catalog and Discounts.

The MICA MFG. CO.
Micasmiths,
88 Fulton Street, N. Y. City.

HUGHES' "GAS WORKS,"

Their Construction and Arrangement,

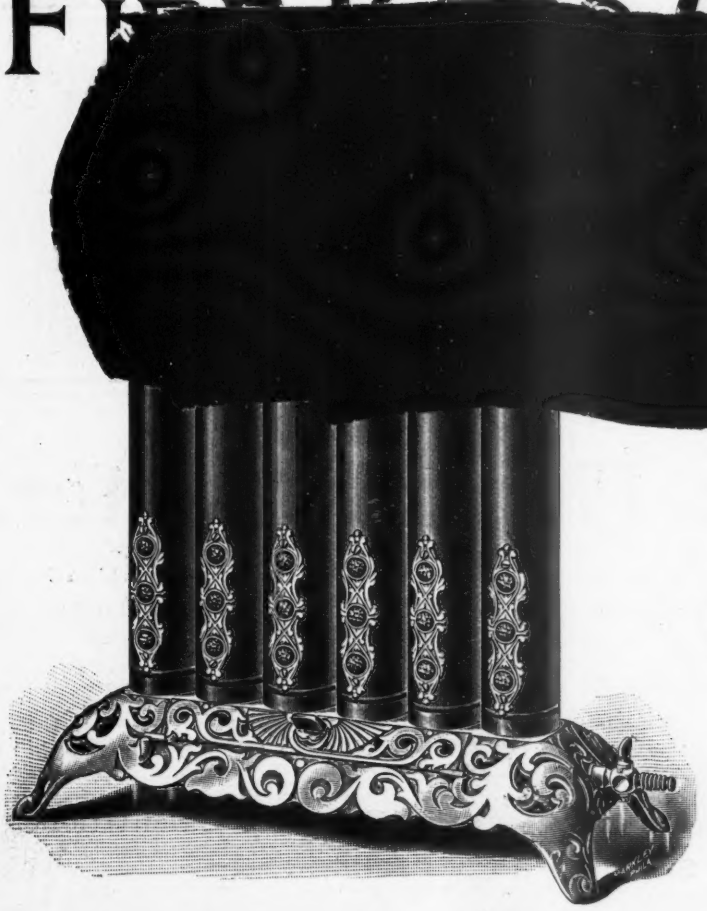
And the Manufacture and Distribution of Coal Gas.

Originally written by SAMUEL HUGHES, C.E.
Rewritten and Much Enlarged by WILLIAM RICHARDS, C.E.

Eighth Edition, Revised, with Notices of Recent Improvements. **Price, $1.65.**

A. M. CALLENDER & CO., No. 32 Pine Street, N. Y. City.

FIRE KING GAS HEATERS



shows our New Low Priced Gas Radiator, which is made in several sizes.

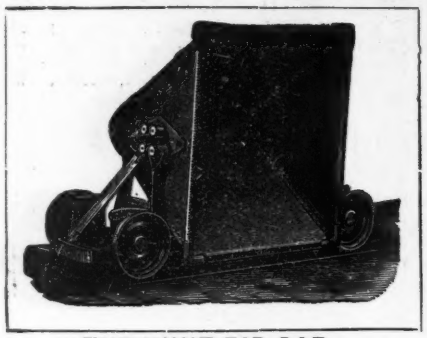
We make a full line of Round and Square Gas Heaters, Gas Grates, Gas Logs, etc., etc.

Get our Catalogue and prices, and order samples of our goods, and you will handle no other.

FIRE KING GAS STOVES & RANGES TRADE MARK BEST IN THE WORLD

A. WEISKITTEL & SON, Baltimore and New York. Largest Manufacturers of Gas Stoves in the World.

C. W. HUNT COMPANY.



THE HUNT TIP CAR.

COKE CARS for Gas Works,
TIP CARS for Carrying Ashes,
CHARGING CARS for Bringing Coal from the Storage Bins to Boiler Room and Retort Houses.

INDUSTRIAL RAILWAYS

Specially designed for handling material in and around

Gas Works, Coal Yards, Factories, Etc., Etc.

45 BROADWAY, - - NEW YORK.

A CONVENIENT
BINDER for the JOURNAL

STRONG.
DURABLE.
LIGHT.
SIMPLE
CHEAP.
HANDSOME.
Price, $1.

A.M. Callender & Co.,
32 Pine st.,
N. Y. City.

WIESTER & CO., 17 & 19 New Montgomery St., San Francisco, Cal.,

PACIFIC COAST AGENTS FOR **THE KEYSTONE METER CO.**

Gas Meters and All Apparatus for Measuring and Testing Gas.

REPAIRING, ALL KINDS OF METERS, PROMPTLY, AND SATISFACTION GUARANTEED.

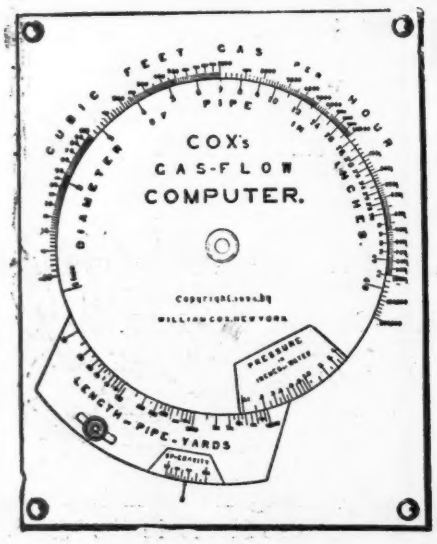
Other Agencies and Showrooms:

New York, New Jersey & Connecticut,
THE BARTLETT LAMP MFG. COMPANY,
66 W. Broadway, N. Y. City.

Western,
CAHILL, SWIFT & CO.,
121-207 S. 7th St., St. Louis, Mo.,

Main Office:
ROYERSFORD, PA.

••• A Full Stock ••• All Sizes on Hand ••• At these Points •••



Cox's Gas Flow Computer.

1. It gives at a glance the discharge of gas from pipes 1 to 48 inches in diameter and 10 to 10,000 yds. long, for any pressure from 0.01 to 10.0 inches of water, and any specific gravity from 0.40 to 1.00.

2. When the required discharge and the length of pipe are given, the diameter corresponding to any pressure is at once seen.

3. When the required discharge and the length of pipe are given, the pressure corresponding to any diameter is at once found.

4. Any suitable combination of the different factors of any problem, under all possible conditions, may be immediately found.

It Prevents Errors and Saves Hours of Tiresome Calculations.

Price, $5.00, per Registered Mail.

For sale by

A. M. CALLENDER & CO., 32 Pine St., N. Y. City.

INJUNCTION ISSUED AGAINST INFRINGERS.

On September 23d the United States Circuit Court for the Southern District of New York granted an injunction restraining and enjoining the further infringement of our Welsbach patent. READ IT.

UNITED STATES CIRCUIT COURT,
Southern District of New York

WELSBACH LIGHT COMPANY.
vs
A. LIEBES. } IN EQUITY.

The President of the United States,

To A. LIEBES, and his servants, agents, attorneys and workmen, GREETING:

WHEREAS, It has been represented to us in our Circuit Court of the United States for the Second Circuit and Southern District of New York, that Letters Patent of the United States No 438,125, were issued in due form of law on the 7th day of October, 1890, to Carl Auer von Welsbach, assignor of the complainant, then known as "Welsbach Incandescent Gas Light Company of New Jersey," and that the complainant herein is the owner of said Letters Patent, and that you, the said A. Liebes, have infringed the rights secured by the aforesaid Letters Patent, by making, using and selling to others to be used, incandescent devices for gas burners, embodying and containing the invention and improvements described and claimed in said Letters Patent No. 438,125.

NOW, THEREFORE, We do strictly command and enjoin you, the said A. Liebes, and your attorneys, agents, servants and workmen under the penalties which may fall upon you in case of disobedience, that you forthwith and forever desist from directly or indirectly making, or causing to be made, delivering, vending, or causing to be sold, offering for sale, using, or causing to be used in any manner, any incandescent devices for gas burners, like, or similar to those which you have heretofore made, used or sold, containing or embodying the invention and improvements described in said Letters Patent No. 438,125, and claimed in the claim thereof, and from counterfeiting or imitating the said invention or improvements or any part or parts thereof, and from in any manner or way whatsoever, violating or infringing the said Letters Patent No. 438,125 and the claim thereof, and from doing, or causing to be done, any other act or thing whatsoever in infringement of the said Letters Patent No. 438,125.

WITNESS, The Honorable Melville W. Fuller, Chief Justice of the United States, at the City of New York, in the Southern District of New York, this twenty-fourth day of September, A. D., 1896.

(SEAL) JOHN A. SHIELDS, Clerk.

(Endorsed) U. S. Circuit Court, Southern District of New York, in Equity.—Welsbach Light Company vs. A. Liebes. Injunction.

A Copy of a Writ of Injunction this day issued out of my office. JOHN A. SHIELDS, Clerk.

We shall proceed against all infringers; manufacturers, dealers and users being equally liable to injunction and damages The decree of the court awarding the injunction also awards profits and damages. Do not be misled or deceived by guarantees offered by infringers, as such guarantees will not protect you against suit, injunction and damages. For your own protection see that you get the genuine Welsbach light All other incandescent gas lights are infringements.

WELSBACH LIGHT COMPANY.

FRED. BREDEL, C.E.

Coal and Water Gas Plants,

OWN SYSTEM.

Recuperative Furnaces, Washers, Condensers, Purifiers, Purifying Machines.

Gas Enriching Plants to Enrich Coal Gas up to 24 Candle Power, and Making a White, Bright, Non-smoking Gas.

COMPLETE GAS WORKS, COKE CONVEYERS, ETC.

No. 118 Farwell Avenue, · · Milwaukee, Wis.

AMERICAN GAS COMPANY,

222 South Third Street, Philadelphia, Pa.

Owns, Operates, Buys and Leases Gas Works.

ALSO UNDERTAKES ALL KINDS OF CONSTRUCTION WORK.

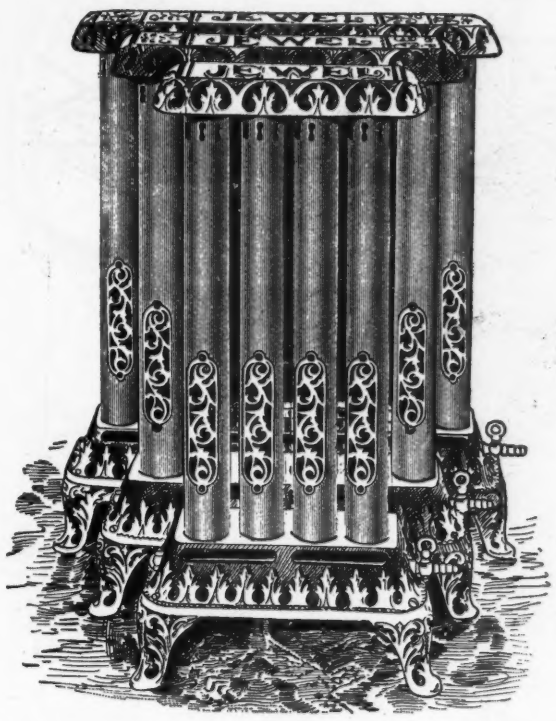
Especially the Installation or Extension of Plants for the Manufacture of Gas from Caking Coal.

The attention of Gas Managers is particularly called to the many improvements in this method of manufacture instituted during the past fifteen years, and the extremely low cost at present of Coal Gas.

CORRESPONDENCE RESPECTFULLY SOLICITED. Address

GEO. G. RAMSDELL, Gen'l Mangr.

JEWEL GAS STOVES



For Heating and Cooking,

ARE ABSOLUTELY PERFECT.

60 Styles of Heaters.

78 Styles of Cookers.

This cut illustrates the new line of Radiators. Three Sizes. Two Styles of Finish.

LOW PRICED. VERY HANDSOME.

Write for Catalog.

GEORGE M. CLARK & COMPANY, Makers, CHICAGO.

THE "VULCAN" GAS HEATERS

And Appliances

Design Patented.

Keep Our Catalogue on File.

For the coming season will embrace a greater variety than ever and include a number of Heaters entirely new in design and construction.

See our new Catalogue and write for Discounts before placing your order.

We make a specialty of supplying Independent and Hose Cocks.

Also, full line of Fittings and Gas Stove Tubing.

Waffle Irons, Cake Griddles,
Hot Closets, Ovens, Candy Stoves,
Water Heaters, etc., etc.

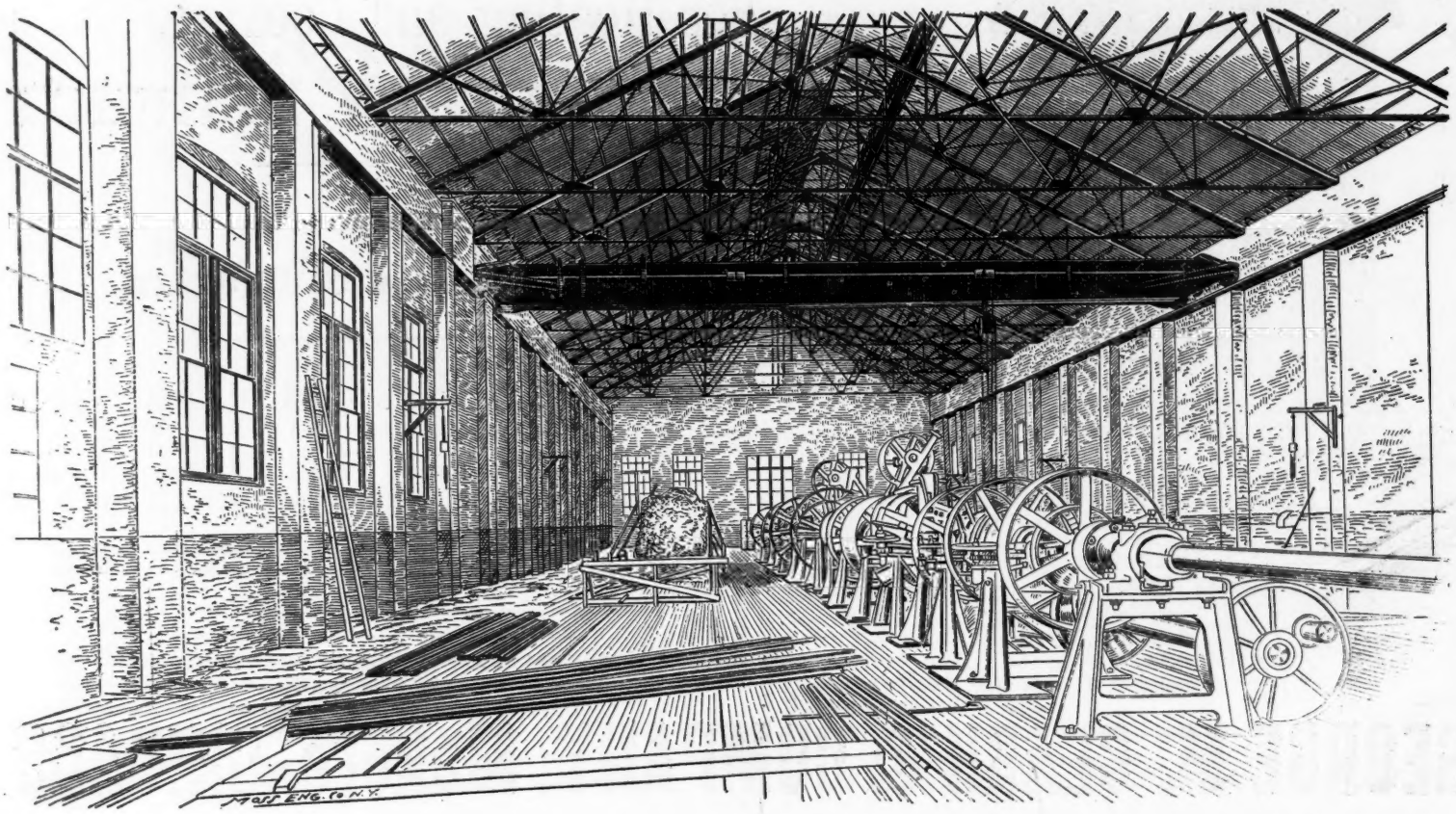
WM. M. CRANE & CO., 838 Broadway, New York.

Factory, 447 to 453 West Fourteenth Street.

CHAS. M. JARVIS, Prest. & Chief Engineer. BURR K. FIELD, Vice-President. GEO. H. SAGE, Secretary. FRANK L. WILCOX, Treasurer.

THE BERLIN IRON BRIDGE CO.

Engineers, Architects, and Builders of Iron and Steel Structures.



The above illustration is taken direct from a photograph, and shows the interior of the Dynamo Room in the Electric Lighting Plant of the Elmira Electric Illuminating Company, at Elmira, N. Y. Besides this, there is a Boiler and Engine Room adjacent to the Dynamo Room. We furnished the Traveling Crane as well as the Iron Roof. The roof is covered with our Patent Anti-Condensation Corrugated Iron, and is guaranteed absolutely fireproof, and not to drip from the underside during the coldest weather. The photograph was taken after the Roof Trusses and Traveling Crane were placed, but before the machinery was started.

Write for Illustrated Catalogue.

Office and Works, No. 6 Railroad Avenue, East Berlin, Conn.

ALEX. C. HUMPHREYS, M.E., MANHATTAN LIFE BUILDING, (64 BROADWAY,) NEW YORK.

CABLE ADDRESS, LONDON & NEW YORK, "HUMGLAS."

ARTHUR G. GLASGOW, M.E., 9 VICTORIA ST., LONDON, S. W., ENGLAND.

HUMPHREYS & GLASGOW,

CONTRACTING AND CONSULTING

GAS ENGINEERS.

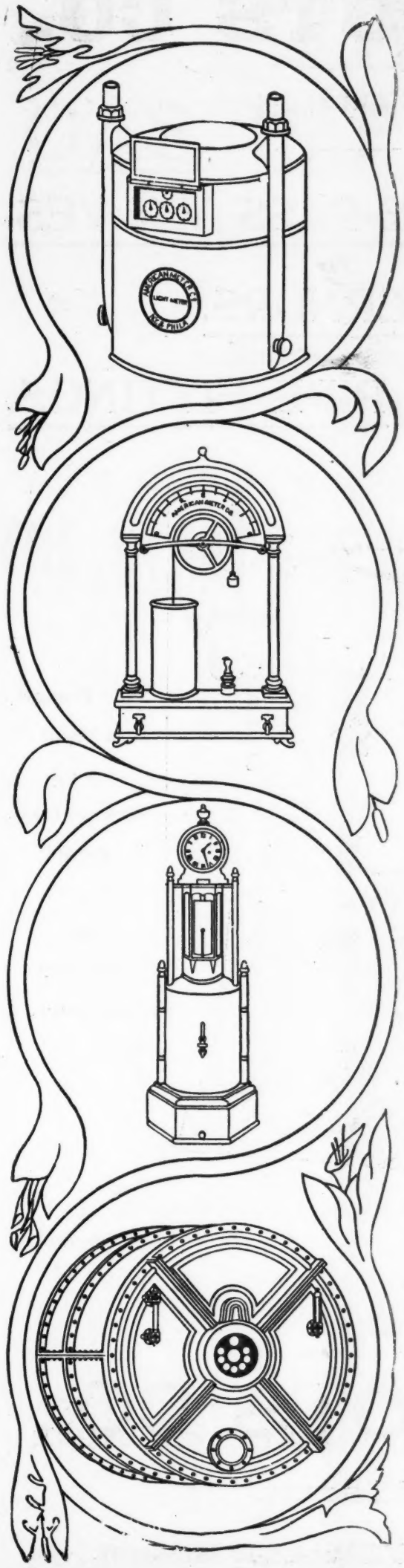
WATER GAS PLANT A SPECIALTY.
GAS PROPERTIES EXAMINED AND VALUED.
ADVICE AS TO IMPROVEMENT OF GAS PROPERTIES AND MANAGEMENT.

THE MANAGEMENT OF SMALL GAS WORKS.

By C. J. R. HUMPHREYS.

Price $1.

A. M. CALLENDER & CO., No. 32 Pine Street New York



(Copyrighted, 1894, by the AMERICAN METER CO.

AMERICAN METER CO.

ESTABLISHED 1834. INCORPORATED 1863.

NEW YORK AND PHILADELPHIA,

CHICAGO, ST. LOUIS,

SAN FRANCISCO.

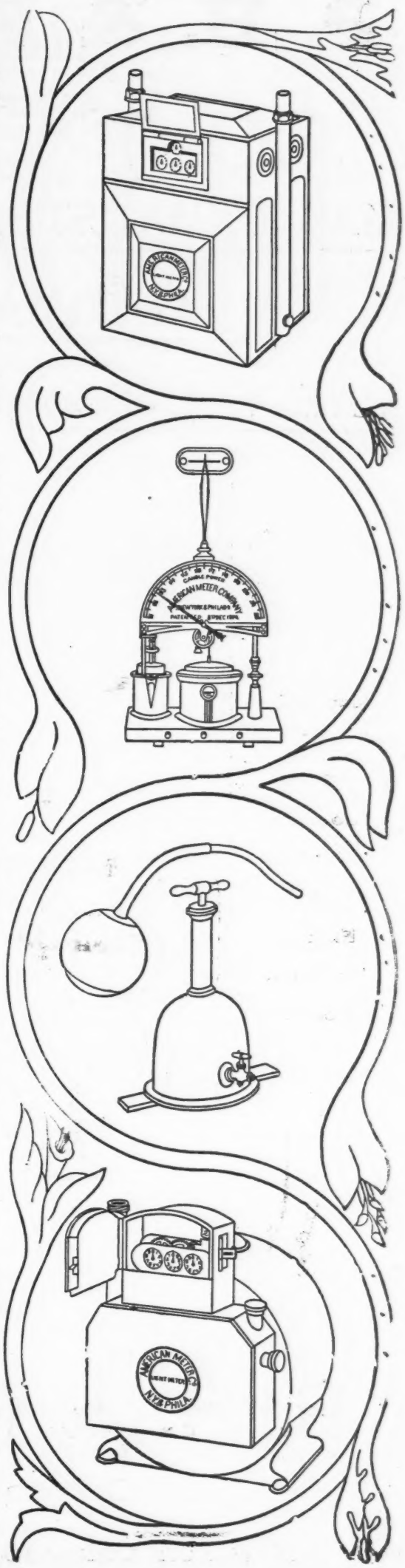
PUBLIC LIGHTING TABLE.

OCTOBER, 1896.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light.	Extinguish.
				P.M.	A.M.
Thu.	1	6.10 PM	1.30 AM	5.30	5.00
Fri.	2	6.10	2.50	5.30	5.00
Sat.	3	6 10	5.00	5.30	5.00
Sun.	4	6.00	5.00	5.30	5.00
Mon.	5	6.00	5.00	5.30	5.00
Tue.	6	6.00 NM	5.00	5.30	5.00
Wed.	7	6 00	5.00	5.30	5.00
Thu.	8	6.00	5.00	5.20	5.10
Fri	9	6.00	5.00	5.20	5.10
Sat.	10	6.00	5.00	5.20	5.10
Sun.	11	7.50	5.10	5.20	5.10
Mon.	12	9.00	5.10	5.20	5.10
Tue.	13	10.10 FQ	5.10	5.20	5.10
Wed.	14	11.10	5.10	5.20	5.10
Thu.	15	12.20 AM	5.10	5.10	5.20
Fri.	16	1.20	5.10	5.10	5.20
Sat.	17	2.20	5.10	5.10	5.20
Sun.	18	3.20	5.20	5.10	5.20
Mon.	19	4.20	5.20	5.10	5.20
Tue.	20	No L.	No L.	5.10	5.20
Wed.	21	No L. FM	No L.	5.10	5.20
Thu.	22	No L.	No L.	5.00	5.30
Fri	23	5.40 PM	6.50 PM	5.00	5.30
Sat.	24	5.40	7.30	5.00	5.30
Sun.	25	5.30	8.10	5.00	5.30
Mon.	26	5.30	9.10	5.00	5.30
Tue.	27	5.30	10.10	5.00	5.30
Wed.	28	5.30	11.20	5.00	5.30
Thu.	29	5.30 LQ	12.30 AM	4.45	5.35
Fri.	30	5.30	1.40	4.45	5.35
Sat.	31	5.30	2.50	4.45	5 35

TOTAL HOURS LIGHTING DURING 1896.

By Table No. 1.	Hrs. Min	By Table No. 2.	Hrs. Min.
January	220.40	January	423.20
February	207.00	February	367 40
March	193,00	March	355.35
April	174.10	April	298.50
May	164.00	May	264.50
June	142.10	June	234.25
July	142 10	July	243.45
August	150.50	August	280.25
September	163.00	September	321.15
October	193.10	October	374.30
November	207.00	November	401.40
December	237.30	December	433.45
Total, yr.	2194.40	Total, yr.	4000.00



P. H. & F. M. ROOTS CO.,

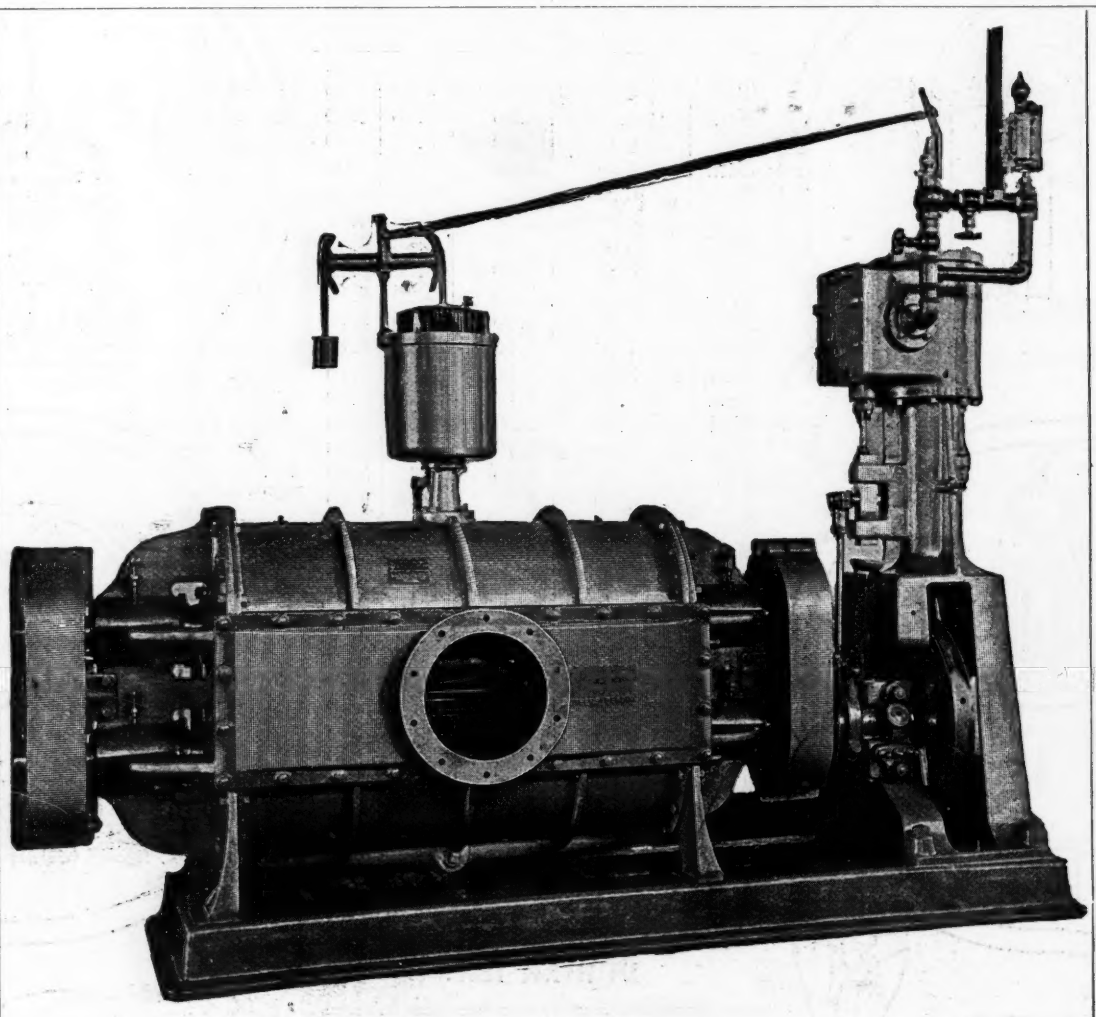
Connersville, Ind.

GAS EXHAUSTERS. BYE-PASS VALVES.

AUTOMATIC GAS GOVERNORS.

GAS VALVES. PIPE FITTINGS.

New Design of Direct Connected Engine and Exhauster on Same Bedplate.



This Design is Used for all Exhausters from No. 7 to No. 10, Inclusive.

Write for Illustrated Catalogue.
Estimates submitted on application.

P. H. & F. M. ROOTS CO.,

Connersville, Indiana.

New York Office, 109 Liberty Street, J. B. STEWART, Manager.

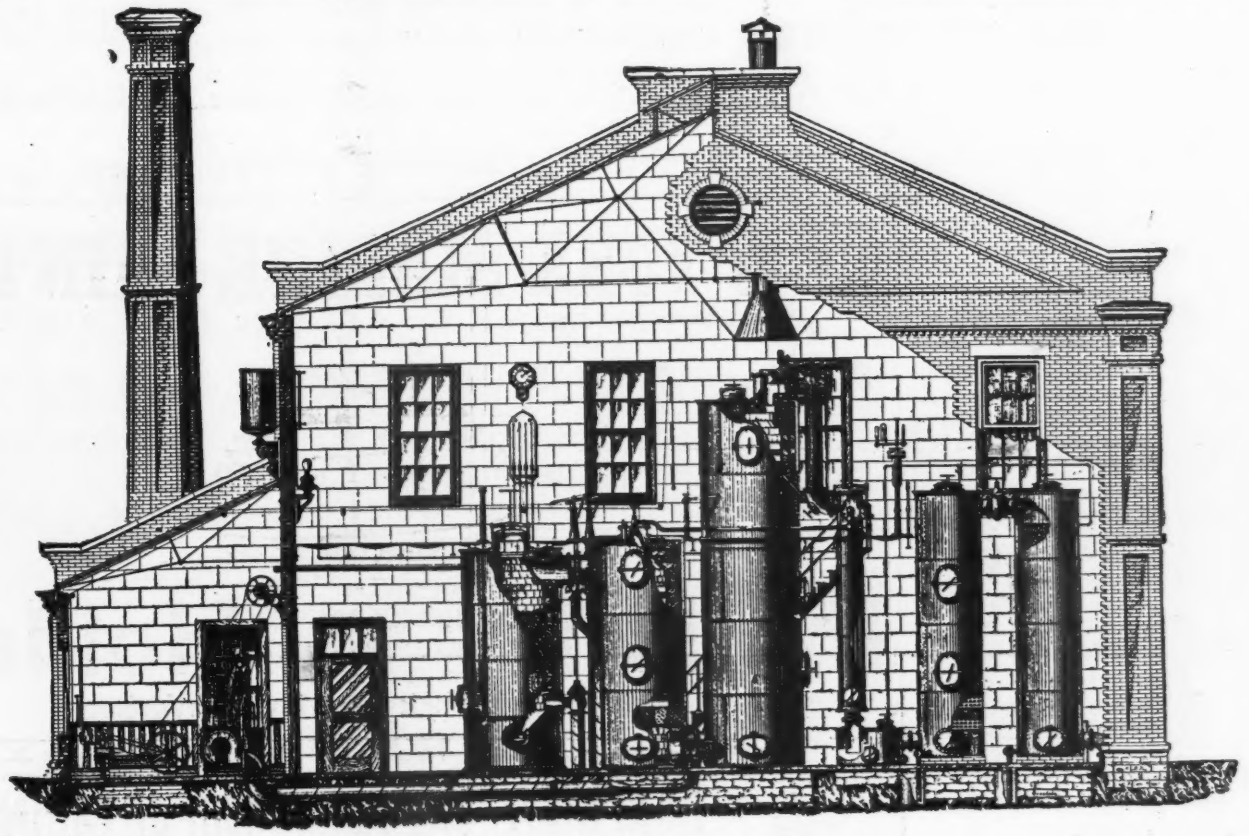
THE UNITED GAS IMPROVEMENT CO.,

DREXEL BUILDING, PHILA., PA.

Inquiries from any part of the United States should be addressed to the Philadelphia Office.

BUILDERS OF

THE STANDARD LOWE WATER GAS APPARATUS.



Standard "Double Superheater" Lowe Apparatus, designed for the use of Naphtha, Crude Oil, or "Distillates."

BUILDERS, LESSEES AND PURCHASERS OF GAS WORKS.

Water Gas Plants, either independent or auxiliary to Coal Gas Works, erected to meet any conditions. Apparatus designed to use any grade of Oil, and Anthracite Coal, or Gas House or Oven Coke.

PAMPHLETS, PLANS AND ESTIMATES FURNISHED UPON APPLICATION.

THE WESTERN GAS CONSTRUCTION CO.,

ENGINEERS and BUILDERS,

FORT WAYNE, INDIANA.

Water Gas Apparatus . . .

Improved Double Superheater Settings,
Improved Single Superheater Settings,
Special Designs for Small Works.

Our apparatus is designed to use any grades of Oils or Naphthas, Gas House or Oven Coke, or Anthracite Coal. Results are Guaranteed.

Coal Gas Apparatus . . .

Agents and Builders { **For FRED. BREDEL—Washers and Purifying System, Mouthpieces and Bench Castings.**
For GEO. SHEPARD PAGE'S SONS—Walker Ammonia Concentrators and Sulphate Stills, Walker Patent Mouthpieces.

Manufacturers of THE WESTERN GAS VALVE, all Iron, Double Gate, 4 to 36 Inch.

Purifiers, Condensers, Scrubbers, Street Main Specials, Iron Roofs, Iron Floors, Oxide Elevators and Conveyer Machinery.

New York Office, 32 Pine Street, WM. HENRY WHITE, Engr.

THE

LUDLOW VALVE MFG. CO.,

MANUFACTURERS OF

VALVES,

Double and Single Gate, ½ in. to 72 in., outside and inside Screws. Indicator, etc., for Gas, Water, Steam, Oil and Ammonia.

SEND FOR CIRCULAR.

SEND FOR CIRCULAR.

ALSO,

Hydraulic Main Dip Regulators, Check Valves, Foot Valves, Yard Wash and Fire Hydrants.

OFFICE AND WORKS:
238 to 254 River St. & 67 to 83 Vail Av.
TROY N Y.

NEW YORK MARINE PAINT CO.

Successors to TRACY & HADDEN.

TRADE MARK
MANUFACTURERS OF

PAINT PECULIARLY ADAPTED TO STAND ON Holders

And all Ironwork about Gas Works.

POUGHKEEPSIE, N. Y.

CHAPMAN VALVE MANUFACTURING CO.,

MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

Also, Gate Fire Hydrants with and witnout Independen Nozzle Valve. All Work Guaranteed.

Works & Gen'l Office, Indian Orchard, Mass, Treasurer's Office, 72 Kilby & 112 Milk Sts., Boston Mass
Chicago Office, 24 West Lake St. New York Office, 28 Platt St.
St. Louis Office, L. M. Rumsey Mfg. Co., 810 North Second St

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE

Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,

70 Rush St., Near Division Ave., Brooklyn, N. Y.

The Gas Engineer's Laboratory Handbook.

By JOHN HORNBY, F.I.C.

Price, $2.50.

A. M. CALLENDER & CO., 32 Pine Street N. Y. City

NATIONAL GAS AND WATER CO.,

218 La Salle Street, Chicago.

Builder and Operator of Gas Works.

The Rew Soft Coal Carbureted Water Gas Apparatus.

TESTED BY THREE YEARS' PRACTICAL OPERATION, AND FULLY GUARANTEED.

Plans and Estimates Upon Application.

IRWIN REW, President and Treasurer. E. E. MORRELL, Engineer.

CONNELLY IRON SPONGE AND GOVERNOR CO.,

(Successors to CONNELLY & CO.)

MANUFACTURERS OF GAS WORKS SPECIALTIES.

"IRON SPONGE." Saves money, saves labor, and is the most efficient purifying material ever offered as a substitute for lime. We guarantee a large saving, both in cost of material and labor.

AUTOMATIC GOVERNOR.

OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT!
WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION!
REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE!
IT IS THE ONLY RECOGNIZED AUTOMATIC GOVERNOR IN THE WORLD!

STEAM JET EXHAUSTER. Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator and Bye-Pass Valves in the most compact form possible. Occupies but little space; uses very little steam; saves formation of carbon in retorts; increases yield 10 to 15 per cent. No works too small to use them profitably.

Prices given on all our specialties, delivered at any point in the United States. Correspondence solicited.

CONNELLY IRON SPONGE AND GOVERNOR CO., No. 365 Canal St., New York.

Practical Photometry.

A GUIDE TO THE STUDY OF THE MEASUREMENT OF LIGHT.

By William Joseph Dibdin.

Price, $3.00.

A. M. CALLENDER & CO.,
32 Pine Street, N. Y. City.

DOUGLAS' FERRIC OXIDE

For Gas Purification

Is a superior natural Hydrated Oxide of Iron. Will give a higher purification per bushel than any other material. We ship the pure Oxide of Iron, containing no sawdust, thus effecting a saving in freight, leaving the consumer to furnish the diluent at a nominal cost. It is now used by the largest gas companies in the West.

Full information, with references to many users, and prices delivered in any locality, furnished on application to

H.W. Douglas (Supt. Ann Arbor Gas Company) **Ann Arbor, Mich.**

IRON MASS

For Gas Purification.

Acts immediately, and more efficiently than any other purifying agent now in use.

Greenpoint Chemical Works.

JOHN SCHRIEVER, Manager.

Greenpoint Ave. & Newtown Creek, Brooklyn N.Y

BOOKS.

DISTILLATION OF COAL TAR AN AMMONIACAL LIQUOR.

By George Lunge. Price $12.50.

TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS.

By David A. Graham. 8vo., Cloth. Price $3.

Orders for these books may be sent to this office.

A. M. CALLENDER & CO., Pine St., N. Y. City

Parson's Steam Blower,

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER.

FOR UTILIZING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER.

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY

H. E. PARSON, Supt., 621 Broadway, N. Y.

JAMES D. PERKINS. **PERKINS & CO.,** F. SEAVERNS.

228 and 229 Produce Exchange, New York City.

TIDEWATER SALES AGENTS FOR THE FOLLOWING:

Ocean Mine Youghiogheny Gas Coal,

Clinch Valley, Thacker & Logan Gas Coals

Old Kentucky Shale and O. K. Boghead.

Shipments from New York, Philadelphia, Baltimore and Norfolk.

BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:

Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully prepared.
For Gas Making or
Heavy Steaming.

FIELD'S ANALYSIS

For the Year 1895.

An Analysis of the Accounts of the Principal Gas Undertakings in England, Scotland, and Ireland. Being the Twenty-seventh Year of Publication. Compiled and Arranged by

JOHN W. FIELD Sec. & Gen. Mangr. of The Gas Lt. & Coke Co., London.

Price, $5. For Sale by

A. M. CALLENDER & CO., - No. 32 Pine Street, N. Y. City.

Coal Tar Genealogical Tree

MR. T. VINER CLARKE, of London, Eng., having compiled a novel Chart or Map illustrating the various

CHEMICAL PRODUCTS DERIVED FROM COAL AND COAL TAR,

In the form of a Genealogical Tree, including all the products discovered to date (the total number amounting to near 700), offers for sale a limited number of copies in Colors, mounted on Linen, with Rollers. Price, $3.50. Orders may be sent to

A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.

GAS ENRICHERS. GAS COALS. GAS COALS.

The Despard Gas Coal Co.,

MINERS AND SHIPPERS OF

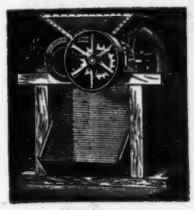
DESPARD GAS COAL,

AND MANUFACTURERS OF

COKE.

MINES, - - Clarksburgh, Harrison Co., West Va.
WHARVES, - - - Locust Point, Baltimore, Md.
OFFICE, - - - 44 South Street, Baltimore, Md.

ROUSSEL & HICKS, 71 Broadway, N. Y. } AGENTS, { BANGS & HORTON 60 Congress St., Boston.



KELLER ADJUSTABLE COKE CRUSHER.

Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER,
Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind.
Correspondence Solicited.

The Gas Engineer's Laboratory Handbook.

BY JOHN HORNBY, F.I.C. Price, $2.50.

A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY

GREENOUGH'S "DIGEST OF GAS CASES."

Price, $5.00.

This is a valuable and important work, a copy of which should be in the possession of every gas company in the country, whether large or small. As a book of reference it will be found invaluable. It is the only work of the kind which has ever been published in this country, and is most complete. Handsomely bound. Orders may be sent to

A. M. CALLENDER & CO., 32 Pine St., N. Y.

— THE —

PENN GAS COAL CO.

OFFER THEIR

Coal, Carefully Screened and Prepared for Gas Purposes.

Their property is located in the Youghiogheny Coal Basin, near Irwin and Penn Stations on the Pennsylvania Railroad, and on the Youghiogheny River.

Principal Office:

Room 720, Reading Terminal Building, Phila., Pa.

Points of Shipment:

Pennsylvania Railroad Piers; Greenwich Wharves, Delaware River; Pier No. 1 (Lower Side), South Amboy, N. J.

EDMUND H. MCCULLOUGH, Prest. CHAS. F. GODSHALL, Treas. H. C. ADAMS, Sec.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J., WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

THE SUN OIL CO.,

OHIO CRUDE OIL,

38 to 41 Degrees Gravity.

Toledo, O., and Pittsburgh, Pa.

Standard Oil Company,

GAS NAPTHA DEPARTMENT.

GAS NAPTHA.

GAS OIL.

Correspondence Solicited.

26 Broadway, New York City

RETORTS AND FIRE BRICK. RETORTS AND FIRE BRICK. RETORTS AND FIRE BRICK.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
H. D. ABERNETHY, Sec.

J. H. Gautier & Co.
Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF
CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE
FLEMMING GENERATOR GAS FURNACE

Brooklyn Fire Brick Works,
MANUFACTURERS OF
CLAY RETORTS, FIRE BRICK,
Gas House and other Tile.
Office, 88 Van Dyke St., Brooklyn, N. Y.

LACLEDE FIRE BRICK MFG. CO.,
MANUFACTURERS OF
Fire Brick, Gas Retorts,
AND
ST. LOUIS STANDARD SEWER PIPE.
Blast Furnace and Cupola Linings, every description of Fire Clay Material, Fire Clay Flue Linings, Chimney Tops Dry Milled and Crude Fire Clays; etc.
OFFICE AND DEPOT
901, 903, and 905 Pine Street
ST. LOUIS, MO.

ESTABLISHED IN 1845.
B. KREISCHER & SONS,
OFFICE FOOT OF HOUSTON ST., E.R., N.Y.
Gas Retorts,
TILES, FIRE BRICK.
AND EVERYTHING IN THE FIRE CLAY LINE.

ADAM WEBER,
Proprietor,
Manhattan Fire Brick and Enameled Clay Retort Works
Works, Weber, N. J.
Office, 633 East 15th St., New York.
Modern Recuperative Furnaces
AND
Standard Fire Brick and Gas Retorts.

Works, LOCKPORT STATION, PA.
—ESTABLISHED 1864.—
JAMES GARDNER, JR.,
Successor to WILLIAM GARDNER & SON.
Conestoga Bldg., Wood & Water Sts.
PITTSBURGH, PA. P. O. Box 373.
Fire Clay Goods for Gas Works.
SOLE REPRESENTATIVE OF THE McILHENNY REGENERATIVE BENCHES FOR THE U. S.

HENRY MAURER & SON,
(ESTABLISHED 1856.)
EXCELSIOR FIRE BRICK & CLAY
RETORT WORKS
WORKS, Perth Amboy, N. J.
OFFICE, 418 to 422 East 23d St., N. Y.
Clay Gas Retorts,
BENCH SETTINGS,
Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT.
A cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.
PRICE LIST.
In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "
C. L. GEROULD & CO.,
N. 3d & Prospect Avs., Mt. Vernon, N.Y.
Western Agent, H. T. GEROULD, Centralia, Ills.

Parker-Russell Mining and Mfg. Co.,
CITY OFFICE,
417 Pine Street, St. Louis, Mo.
PROPRIETORS OF THE
OAKHILL GAS RETORT & FIRE BRICK W'KS
Our immense establishment is now employed almost entirely in the manufacture of
Materials for Gas Companies
We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct
Half and Full Depth Benches of Our Own Design,
Containing 6, 8 or 9 Retorts.
We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

THEO. J. SMITH, Prest. J. A. TAYLOR, Sec'y.
A. LAMBLA, Vice-Prest. and Supt.
BALTIMORE RETORT & FIRE BRICK CO.
MANUFACTORY AT
LOCUST POINT BALTIMORE MD.
Clay Retorts, Blocks & Tiles
FIRE BRICK, FIRE CLAY,
AND FIRE CEMENT.
Red and Buff Ornamental Tiles and Chimney Tops. Baker Oven Tiles 12x12x2 and 10x10x2.
WALDO BROS., 88 WATER ST., BOSTON, MASS
Sole Agents for New England States.

PRACTICAL PHOTOMETRY.
A Guide to the Study of the Measurement of Light.
By WILLIAM JOSEPH DIBDIN.
With Numerous Illustrations Price, $3.00. A. M. CALLENDER & CO 32 Pine Street, N. Y. City

WM. W. GOODWIN, Prest. O. N. GULDLIN, V.-Prest. & Treas. H. B. GOODWIN, Sec. ERNEST F. LLOYD, Asst. Sec

THE AMERICAN GAS ENGINE CO.,

MANUFACTURERS OF

The Double-Acting Gas Engine,

Under the Patents of Griffin, and Dick, Kerr & Co., of London and Kilmarnock.

Single Cylinder.

Impulse Every Revolution.

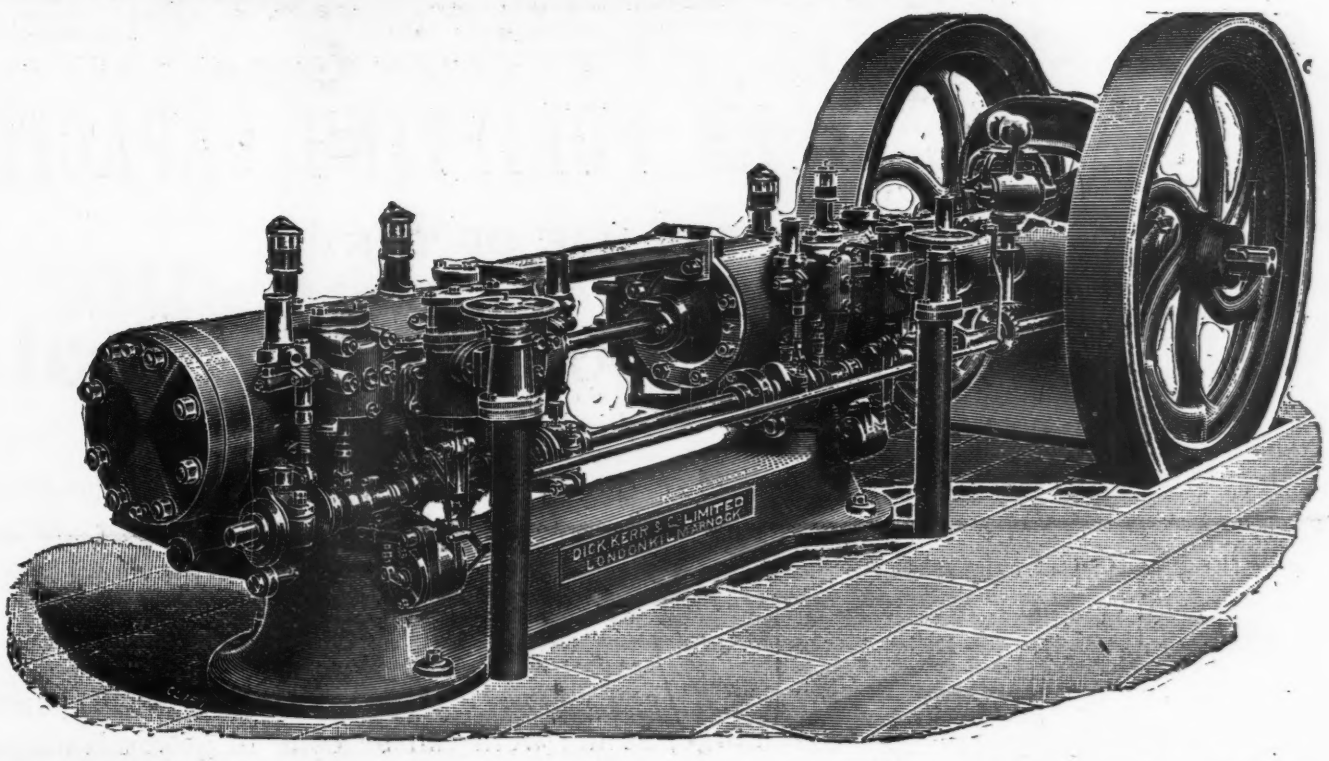
(Two Strokes.)

15 to 500 Horse Power.

For General Work and Isolated Electric Plants.

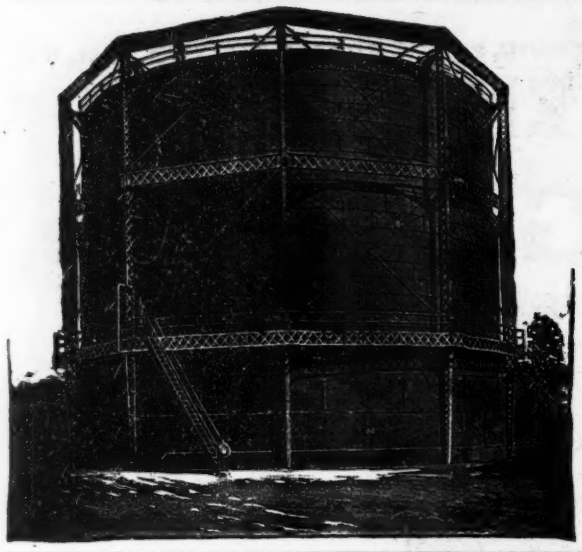
Tandem Cylinder. Impulse Every Stroke. 100 to 1,600 Horse Power.

For Central Stations and all work requiring extreme steadiness.



ESSENTIAL PRINCIPLE.—An impulse at each end of piston; using half force to each impulse; doubling the steadiness; reducing the wear on moving parts, and weight for given power. **CONSTRUCTION.**—The piston rod works through stuffing box in front end of cylinder, and connecting rod is carried in a cross-head working in a slide in frame, as in ordinary steam engine practice. All valves are of the poppet type, operated by cams on a single cam-shaft, giving positive movement to every working part. Tube or electric ignition. **RESULT.**—An engine of extreme simplicity and steadiness of action, the even wear on the cylinder and all working parts assuring increased economy, long life, and minimum cost in repairs. **RECORD.**—Successful and constant use in Great Britain for the past eight years. Address

W. W. GOODWIN, President, 532 Bourse Building, Philadelphia Pa. or
THE WESTERN GAS CONSTRUCTION CO. Bldrs. & Gen. Agts. Fort Wayne Ind.



DAVIS & FARNUM MFG. CO.,

WALTHAM, MASS.

Principal Office & Works, Waltham, Mass. Boston Office, R'm 18, Vulcan Bldg., 8 Oliver St.

Single, Double and Triple-Lift Gasholders of any Capacity. Tubular, Pipe and Sinuous Friction Condensers of all Sizes.

Steel Tanks for Gasholders, Iron Roof Frames and Floors, Purifying Boxes, Center Seal or Valve Connections, Bench Work, Reversible Lime Trays.

Self-Sealing and Pressed Steel Mouthpiece Lids.

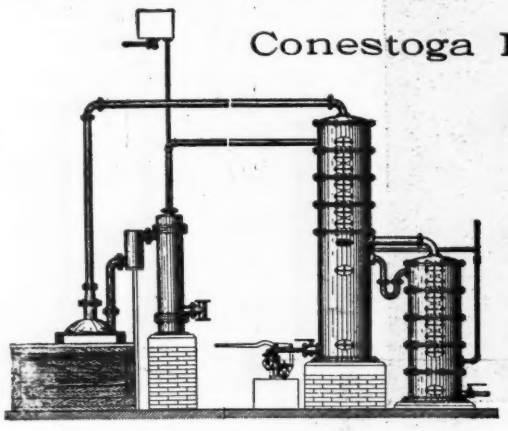
Coke Borrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Works.

Also, Gas and Water Pipe, Flanged Pipe, Sugar House Work, and Special Castings of all Descriptions.

GAS ENGINEERING COMPANY,

INCORPORATED,

Conestoga Building, PITTSBURGH, PA.



AMMONIA MACHINE.

MANUFACTURERS OF

Gas Works Machinery of all kinds,

PATENTEE AND OWNER OF

PITTSBURGH WASHER-SCRUBBER,

SOLE AGENT FOR

FELDMANN AMMONIA MACHINE,

For producing Sulphate, Aqua, Chloride and Concentrated Liquors.

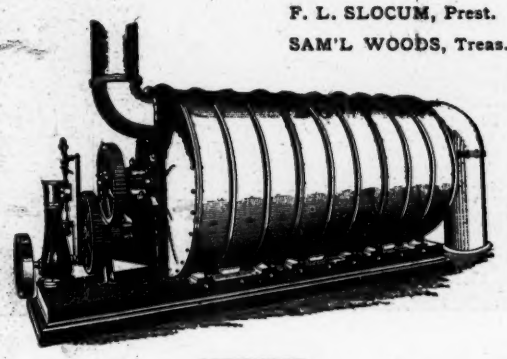
The Erection of Bi-Product Coke Ovens a Specialty.

Faux System of Recuperative Benches,

JAS. GARDNER, JR.
SOLE CONSTRUCTOR AND BUILDER.

NEW SYSTEM HYDRAULIC MAIN.

F. L. SLOCUM, Prest.
SAM'L WOODS, Treas.



SCRUBBER.

INCREASE YOUR PURIFYING CAPACITY

BY THE USE OF THE

"Crighton" Four-Box Center Seal Cap.

Having recently perfected and patented a Five-way Center Seal Cap, we are now in position to offer and recommend it to Gas Companies for increasing their purifying capacity at a moderate cost.

With this Cap you can have **all your Purifying Boxes in constant use,** and where four boxes are in operation at one time, **the capacity is increased one-third.**

Your present Center Seal can be used, and will **only require a new Cap.** Under ordinary circumstances **the change can be made in one day,** and will not necessitate the disturbing of your connections.

Now is the time to make the change, as the work can be done to good advantage during the season of your lightest output.

For information and prices address

KERR MURRAY MFG. CO.,

Manufacturers of Gas Works Apparatus and Holders,

FORT WAYNE, IND.

BARTLETT, HAYWARD & CO.

BALTIMORE, MD.

Triple, Double & Single-Lift

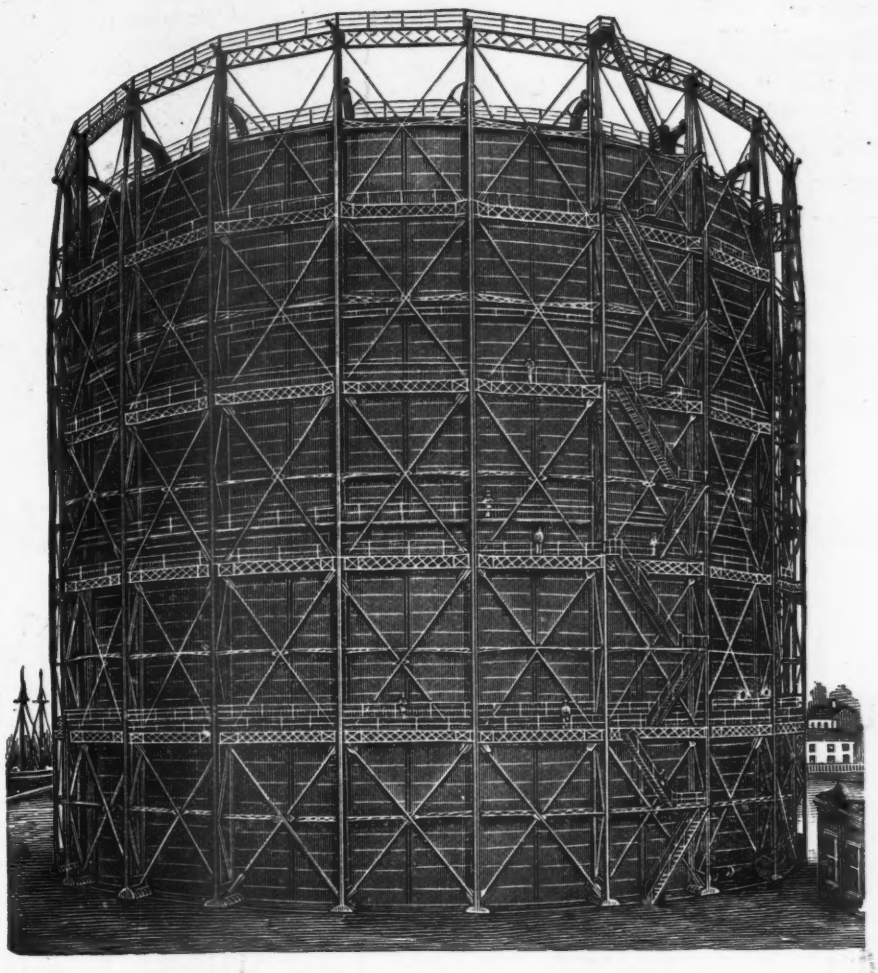
GASHOLDERS.

Iron Holder Tanks.

ROOF FRAMES.

Girders.

BEAMS



PURIFIERS.

CONDENSERS.

Scrubbers.

Bench Castings.

OIL STORAGE TANKS.

Boilers.

Three Four-Lift Gasholders, each of 4,289,500 Cubic Feet Capacity, Erected in Chicago.

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSABLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

MILL'S REVERSIBLE LIME TRAYS.

Gas Works Designed and Constructed.

W. H. PEARSON, President. J. T. WESTCOTT, Gen'l Mang'r & Treas. L. L. MERRIFIELD, Chief Engineer.

The Economical Gas Apparatus Construction Co., Ld.

269 Front Street, East, - - Toronto, Canada.

ENGINEERS AND BUILDERS

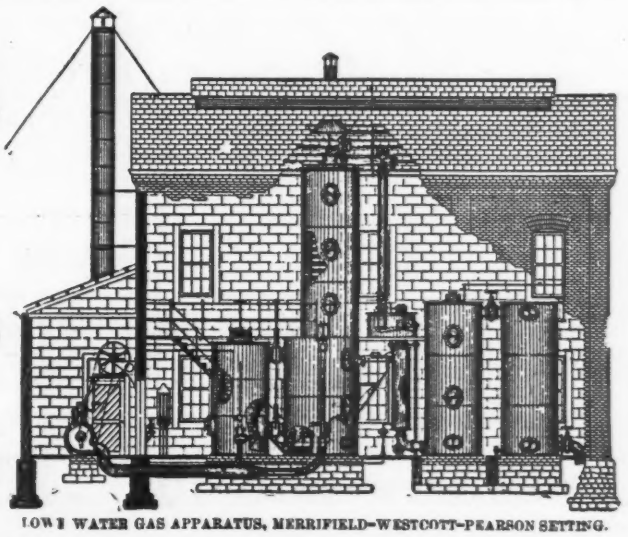
OF THE

Improved Lowe Water Gas Apparatus

Designed to give the Greatest Efficiency when using any kind of Oil, Anthracite Coal, Gas House or Oven Coke.

New Gas Works Built, Present Gas Plants, either Coal or Water, Remodeled

Catalogues, Plans and Estimates Furnished upon Application.



LOWE WATER GAS APPARATUS, MERRIFIELD-WESTCOTT-PEARSON SETTING.

R. D. WOOD & CO.,

ENGINEERS, IRON FOUNDERS, MACHINISTS.

400 Chestnut Street, Philadelphia, Pa.

MANUFACTURERS OF

CAST IRON PIPE.

BUILDERS OF

Gas Holders,

Single, Double and Triple Lifts, with or without Wrought Iron or Steel Tanks.

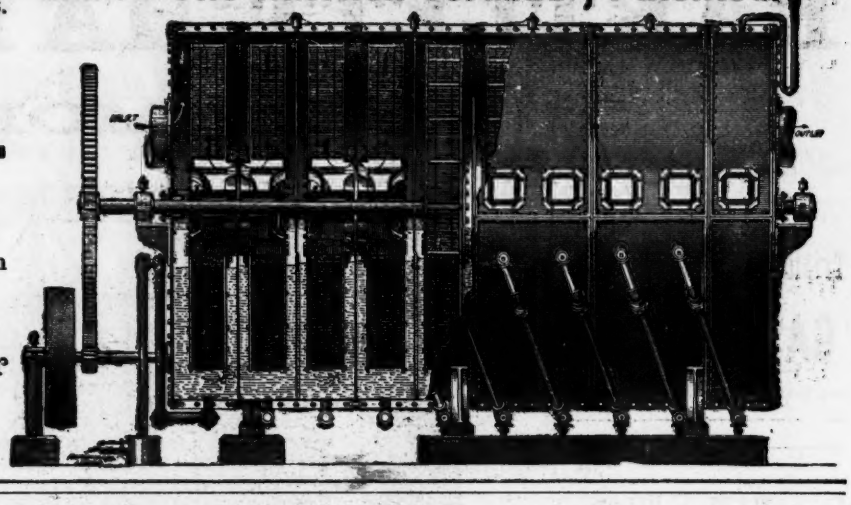
PURIFIERS, CONDENSERS, SCRUBBERS.

The Hopper Automatic Gas Governor

Send for Pamphlet.

Dunham Patent Specials.

Sole Makers of **The Mitchell Scrubber, Patented.**



ISBELL-PORTER CO.,

ENGINEERS AND CONTRACTORS FOR THE

Construction and Extension of Gas Works.

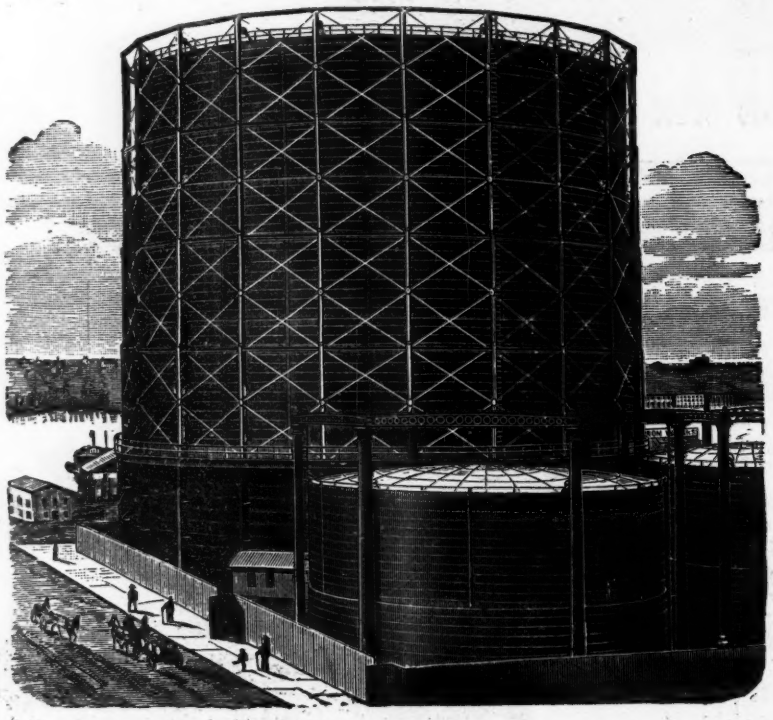
FOUNDERS AND MACHINISTS.

MANUFACTURERS OF

All Ironwork and Machinery Required in a Gas Plant.

Estimates, Drawings and Specifications furnished for the Alteration, Improvement, or Extension of Existing Works or the Construction of New Works.

245 Broadway, New York City. —OFFICES— **Bridge & Ogden Sts., Newark, N. J.**



The Continental Iron Works,

THOMAS F. ROWLAND, President.
WARREN E. HILL and CHAS. H. CORBETT, Vice-Presidents.
THOMAS F. ROWLAND, Jr., Secretary & Treasurer.

BROOKLYN, N. Y.

TAKE EAST TENTH OR TWENTY-THIRD STREET FERRIES FROM N. Y. TO GREENPOINT.

BUILDERS OF

Gas Holders.

Single and Multiple Section Gas Holders a Specialty.

Wrought Iron Gas Holder Tanks.

BENCH CASTINGS, RETORT LIDS.

Hydraulic Mains, Condensers, Scrubbers Purifiers, Valves, Etc.

Self-Sealing Retort Mouthpieces & Lids

For Round, Oval, or "D" Retorts.

ILLUMINATING GAS! FUEL GAS!

THE LOOMIS PROCESS.

Now in successful operation at Works of John Russell Cutlery Co., Turner's Falls, Mass., and Henry Disston's Son's Saw Works, Tacony, Pa.

The Cheapest Gas Generating System in the World.

Plans and Estimates Furnished.

BURDETT LOOMIS, - - Hartford, Conn.

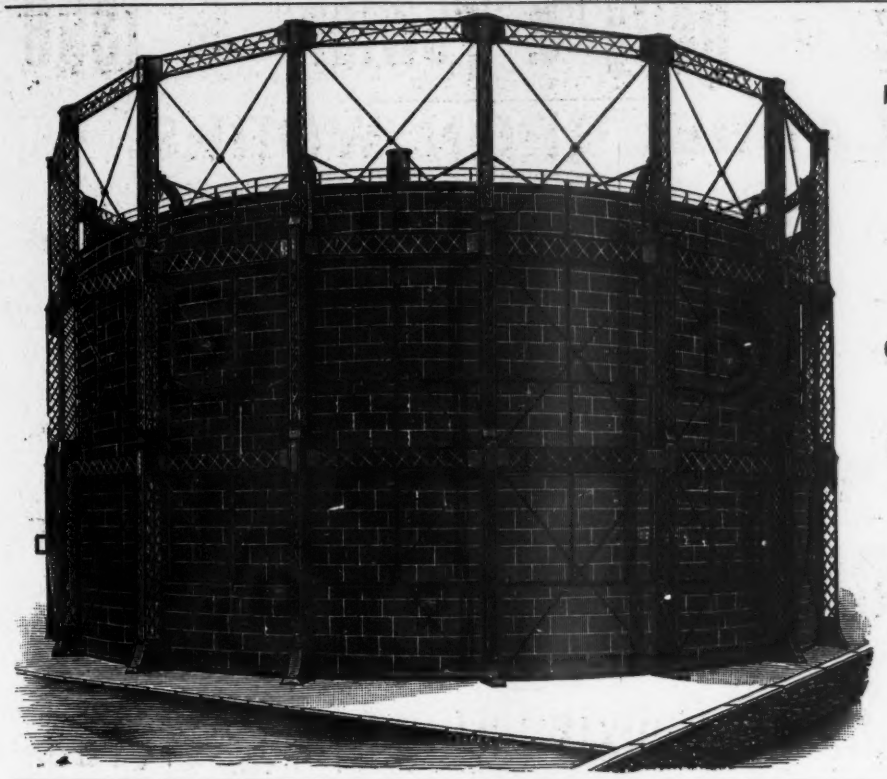
To Gas Companies.

We make to order **CAP BURNERS** to burn any amount under a stated pressure. Send for samples.

Also, SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,
248 N. 8th St., Phila., Pa.

GAS WORKS APPARATUS AND CONSTRUCTION. GAS WORKS APPARATUS AND CONSTRUCTION.



H. RANSHAW, Prest. & Mangr. T. H. BIRCH, Asst. Mangr
WILLIAM STACEY, Vice-Prest. R. J. TARVIN, Sec. & Treas.

THE STACEY MANUFACTURING CO
Established 1851.

Single, Double and Triple-Lift

GASHOLDERS,

Of any Capacity, with or without Wrought Iron or Steel Tanks.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, etc.

Coal Gas Benches, Roof Frames,

OIL STORAGE TANKS.

Pressed Steel Mouthpiece Lids, Self-Sealing Mouthpiece Lids.

Cincinnati, Ohio.

George Shepard Page's Sons,

Sole Agents for

The "Standard" Washer-Scrubber,

The Walker Tar and Carbonic Acid Extractor, The Walker Sulphate and Ammonia Still,
The Walker Self-Sealing Pressed Steel Mouthpiece Lids.

The Berlin Center Valve. And Contractors for Ammoniacal Liquor.

No. 69 Wall Street, New York City.

Practical Hints
ON THE CONSTRUCTION AND WORKING OF
Regenerator Furnaces,
By MAURICE GRAHAM, C.E.
Price, $1.25.
A. M. CALLENDER & CO., 32 Pine Street, N. Y.

GEORGE R. ROWLAND,
Formerly with the Continental Iron Works.
Draughtsman and Constructing Engineer.
Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.
Office, No. 245 Broadway, N. Y. City.

T. G. LANSDEN,
Consulting and Contracting Gas Engineer
Estimates, Plans and Specifications for New Works (Coa or Water Gas), and for Extensions or Alterations.
Room H, 108 N. 4th St., St. Louis, Mo.

WM. HENRY WHITE,

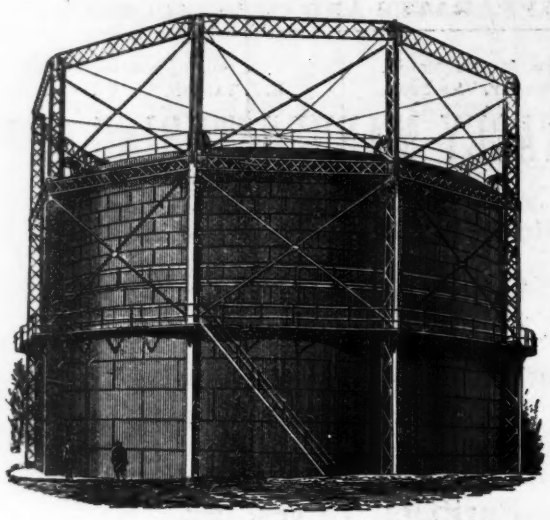
No. 32 Pine Street, - - - New York City.

ENGINEER AND CONTRACTOR FOR THE

ERECTION AND EXTENSION OF

GAS, WATER, AND ELECTRIC LIGHT WORKS.

Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited
Plans and Estimates Furnished.



1842 * Deily & Fowler, * 1896

LAUREL IRON WORKS.

Office, No. 39 Laurel Street, Philadelphia, Pa.

BUILDERS OF

Gasholders

Single or Telescopic. With or Without Iron or Steel Tanks.

OIL TANKS, WATER TANKS, AND GENERAL WROUGHT IRON WORK.

JAMES R. FLOYD & SONS,

Successors to HERRING & FLOYD,

Oregon Iron Works,

West 20th and 21st Streets, Between 10th & 11th Avenues, New York City.

Engineers and Contractors for the Construction of Gas Works.

MANUFACTURERS OF ALL KINDS OF CASTINGS AND GENERAL IRONWORK FOR GAS APPARATUS.

Bench Castings, Regenerative and Half Regenerative Furnace Castings, Condensers, Tower Scrubbers, Mechanical Scrubbers, Purifiers, Malleable Iron Retort Lids, Self-Sealing Retort Lids, Hydraulic Hoist Purifier Carriage, Crosses, Tees, Bends, Angles, Reducers, S-Bends, Sectional Sleeves, Plugs, Caps, Street Drips, etc., always on hand.

WOOD'S GAS SCRUBBING AND ENRICHING APPARATUS.

In use at Syracuse, Auburn, Watertown, Cortland and Geneva, N.Y.; Elizabeth, N. J.; Boston, Mass.; Jamaica Plain, Mass.; Providence, R. I.; Northern Liberties Gas Co., Phila.

Sole Manufacturers of the OGDEN QUICK-MOVING VALVE.

Premium Awarded, World's Columbian Exposition.

HEARNE CENTER SEAL, Operating One, Two, Three or Four Boxes.

SCIENTIFIC BOOKS.

GAS MANUFACTURE, by William Richards. 4to., with numerous Engravings and Plates, in Cloth binding. $12.

TECHNICAL GAS ANALYSIS. $3.

GAS CONSUMER'S HANDYBOOK, by Wm. Richards, C.E. 20 cents.

PRACTICAL TREATISE ON HEAT AND VENTILATION, with Special Relation to Illuminating, Heating and Cooking by Gas. By E. E. Perkins. $1.25.

CHEMISTRY OF ILLUMINATING GAS. By Norton H. Humphrys. $2.40.

PRACTICAL TREATISE ON HEAT By Thomas Box. 2d edition. $5.

PRACTICAL PHOTOMETRY: A Guide to the Study of the Measurement of Light. By W. J. Dibdin. $3.

CHEMICAL TECHNOLOGY: Vol. I., *Fuel and Its Applications*, $5. Vol. II., *Lighting*, $4.

IRONWORK: Practical Designing of Structural Ironwork. By H. Adams. $3.50.

GAS WORKS: Their Arrangement, Construction, Plant and Machinery. $5.

PRACTICAL HANDBOOK ON GAS ENGINES, by G. Lieckfield. $1.

LIQUID FUEL FOR MECHANICAL AND INDUSTRIAL PURPOSES. By E. A. Brayley Hodgetts. $2.50.

COAL, SPONTANEOUS COMBUSTION OF. By Thomas Rowan, C.E. $2.

COAL: Its History and Use. By Prof. Thorpe. $3.50.

THE GAS WORKS OF LONDON. By Colburn. 60 cents.

HEAT A MODE OF MOTION. By John Tyndall. $2.50.

THE MANAGEMENT OF SMALL GAS WORKS. By C. J. R. Humphreys. $1.

MANUAL FOR GAS ENGINEERING STUDENTS. By D. Lee. 40 cents.

THEORY OF HEAT. By J. Clerk-Maxwell. $1.50.

AMMONIA AND AMMONIUM COMPOUNDS. By Dr. R. Arnold. $2.

DIGEST OF GAS CASES. $5.

DISTILLATION OF COAL TAR AND AMMONIACAL LIQUOR. By Geo. Lunge. New edition. $12.50.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS. By D. A. Graham. $3.

A TEXT BOOK OF INORGANIC CHEMISTRY. By Prof. Victor Von Richter. $2.

ILLUMINATING AND HEATING GAS. By W. Burns. $1.50

HANDBOOK FOR MECHANICAL ENGINEERS. By H. Adams. $2.50.

TREATISE ON MASONRY CONSTRUCTION. Baker. $5.

GAS ENGINEER'S LABORATORY HANDBOOK. By Jno. Hornby, F.I.C. $2.50.

GAS LIGHTING AND GAS FITTING. By W. P. Gerhard. 50 cents.

PRACTICAL PLUMBING. By P. J. Davies. $3.

AMERICAN PLUMBING. By Alfred Revill. $2.

CEMENT; A Manual of Lime and Cement, their Treatment and Use in Construction. By A. H. Heath. $2.50.

ELECTRICITY.

INDUSTRIAL PHOTOMETRY, with Special Application to Electric Lighting. By A. Palaz, Sc.D. $4.

ELEMENTS OF ELECTRIC LIGHTING, Including Electric Generation, Measurement, Storage and Distribution. By Philip Atkinson. $1.50.

ELECTRIC TRANSMISSION OF ENERGY. By G. Knapp. $3.

ELECTRICIAN'S POCKETBOOK. By Monroe and Jamieson. $2.50.

MAGNETISM AND ELECTRICITY. By J. Overend 40 cts.

DYNAMO BUILDING. By F. W. Walker. 50 cents.

DOMESTIC ELECTRICITY FOR AMATEURS. By E. Hospitalier. $2.50.

PRACTICAL MANAGEMENT OF DYNAMOS AND MOTORS. $1.

PRACTICAL GUIDE TO THE TESTING OF INSULATED WIRES AND CABLES. $1.

ELECTRIC LIGHT FITTING. $2.

PRACTICAL ELECTRICITY. $2.50.

ELECTRICITY FOR ENGINEERS. $2.50.

ELECTRICITY, Its Theory, Sources and Applications. By John T. Sprague, M.I.E.E. $6.

The above will be forwarded by express, upon receipt of price. If sent by mail, postage must be added to above prices. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt or order All remittances should be made by check, draft, or post office money order. No books sent C.O.D.

A. M. CALLENDER & CO., 32 Pine Street, New York.

GAS AND WATER PIPES.

THE OHIO PIPE COMPANY,

MANUFACTURERS OF

Cast Iron Gas & Water Pipe,

BRANCH AND SPECIAL CASTINGS.

Gas-House Bench Castings, Hydraulics, Lamp Posts, Flange Pipe and Specials, Architectural Castings, Building Columns, Joists, Cellar Grates, Sash Weights, etc.

GENERAL FOUNDERS AND MACHINISTS.

Columbus, Ohio.

Cast Iron Pipe For Natural or Artificial Gas, Flange Pipe, Electric Light Posts.

The Addyston Pipe & Steel Co., Cincinnati, O.

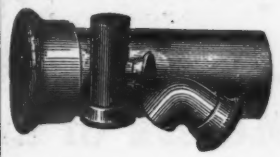
The Chemistry of Illuminating Gas.

By NORTON H. HUMPHRYS. Price, $2.10.

A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY.

GAS METERS.

WARREN FOUNDRY AND MACHINE CO.,



Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.

CAST IRON WATER AND GAS PIPE

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc

EASTERN OFFICE: NEW YORK, 192 BROADWAY.

WESTERN OFFICE: CHICAGO, MONADNOCK BLK

M. J. DRUMMOND

MANUFACTURER OF

CAST IRON

FLANGE

GAS AND WATER PIPE

AND GENERAL FOUNDRY WORK

GEORGE ORMROD, Mangr. & Treas., Emaus, Pa.
JOHN DONALDSON, Prest., Betz Bldg., Phila., Pa

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

JOS. R. THOMAS,

No. 32 Pine Street, N.Y. City.

CONSULTING AND CONSTRUCTING

Gas Engineer and Contractor

PLANS, SPECIFICATIONS AND ESTIMATES FURNISHED.

Contracts taken for all Appliance required at a Gas Works,

Either for New Works or Extensions to Old Plants

DAVID LEAVITT HOUGH,

26 CORTLANDT ST., N.Y. CITY.

Consulting Engineer

Investigations and Appraisals.
Designs and Estimates.

Contractor.

Machinery and Structures.
Gas and Water Pipe.

Special Agent for Selling & Purchasing

Temporary Address,
Care Messrs. Brown Shipley & Co., London, Eng.

1894 DIRECTORY 1894

OF AMERICAN GAS COMPANIES

Price, - - - - - - - - $5.00.

A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.

PRACTICAL HANDBOOK ON

GAS ENGINES

With Instructions for Care and Working of the Same.

By G. LIECKFELD, C.E.

Translated with Permission of the author by GEO. M. RICHMOND, M.E.

Price, $1.00.

A. M. CALLENDER & CO., 32 Pine Street, New York.

Established 1849. With the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

NATHANIEL TUFTS,

153 Franklin St., Boston, Mass.

C. W. HINMAN, - - Manager.

MANUFACTURER OF

DRY GAS METERS.

Station Meters of any Capacity.

Test and Experimental Meters, Pressure Registers, Pressure Gauges.

METER PROVERS, PHOTOMETERS, STREET LANTERNS, ETC., ETC.

Apparatus for the Chemical Testing of Gas and Gas Liquor.

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

THE MARYLAND METER AND MANUFACTURING CO.

Established 1866.

BALTIMORE, North & Saratoga Sts. **CHICAGO, 107 West Monroe St.**
NEW YORK, 838 Broadway. **SAN FRANCISCO, 221 Front St.**
BOSTON, 92 Water Street, Rooms 21 and 22.

CONSUMERS' & STATION METERS, PRESSURE GAUGES, Etc., Etc.

"Perfect" Gas Stoves

THE GOODWIN METER COMPANY,

1012-1018 Filbert Street, Philadelphia, Pa.

MANUFACTURERS OF

Consumers' and Station Meters,

Standard Photometrical and Analytical Gas Apparatus

"SUN DIAL" GAS COOKING AND HEATING STOVES.

Particular attention given to Repairing Meters and Scientific Apparatus. . . .

GEORGE B. EDWARDS, Agent,
113 Chambers Street, N. Y. City.

METRIC METAL COMPANY,

MANUFACTURERS OF

DRY GAS METERS

For all Kinds of Service.

ALSO MAKERS OF THE

MATCHLESS CLASSIC GAS COOK STOVES AND RANGES.

Send for '96 Stove Catalogue. Factory at Erie, Pa.

THE AMERICAN METER CO.

Established 1834. Incorporated 1863.

WET AND DRY GAS METERS. PRESSURE REGISTERS. METER PROVERS.
STATION METERS. PRESSURE & VACUUM REGISTERS. PORTABLE TEST METERS.
EXHAUSTER GOVERNORS. PRESSURE & VACUUM GAUGES. EXPERIMENTAL METERS.
DRY CENTER VALVES. CRESSON GAS REGULATORS. AMMONIA TEST METERS.
GOVERNORS FOR GAS WORKS. MARSLAND WATER METERS. BAR & JET PHOTOMETERS.

Manufactories:
512 West 22d St., N. Y.
Arch & 22d Sts., Phila.

GAS STOVES.
SUGG'S "STANDARD" ARGAND BURNERS,
SUGG'S ILLUMINATING POWER METER,
Wet Meters, with Lizar's "Invariable Measuring" Drum.

Agencies:
125 & 127 S. Clinton Street, Chicago.
810 North Second Street, St. Louis.
222 Sutter Street, San Francisco.

HELME & McILHENNY,

Established 1848. **1339 to 1349 Cherry Street, Philadelphia, Pa.**

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

D. McDONALD & CO.,

Established 1854.

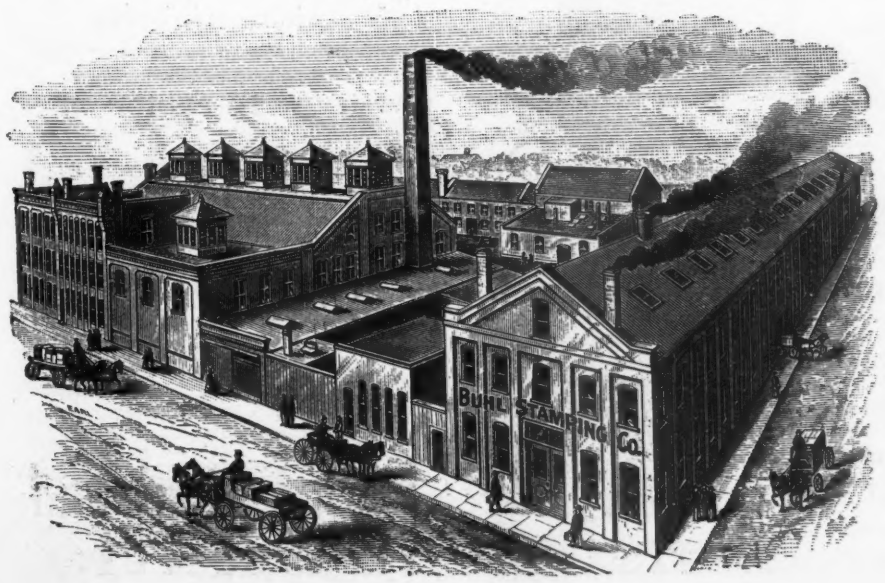
511 West 21st Street, NEW YORK CITY.
51, 53 & 55 Lancaster St., ALBANY, N. Y.
34 & 36 W. Monroe St., CHICAGO, ILL.

MANUFACTURERS OF

Wet and Dry Gas Meters

STATION METERS, EXPERIMENTAL METERS, METER PROVERS, PRESSURE & VACUUM REGISTERS & PRESSURE GAUGES.

Meters of all makers Thoroughly Repaired.



T. D. BUHL, Pres't. CHAS. H. JACOBS, Vice-Pres't & Manager.

BUHL STAMPING CO.

Detroit, Mich.

Makers of Gas Meters.

OUR equipment embraces the Latest and Most Improved Machinery. We make our own Tin Plate. We claim for **"BUHL" METERS, Increased Durability,** with probability of **Fewer and Less Expensive Repairs,** and **More Accurate Adjustment.** Comparisons invited. Meters of other makers promptly repaired. Mail orders solicited.

The Advertisement of the

OTTO GAS ENGINE WORKS,

33d and Walnut Streets, Philadelphia,

New York, 18 Vesey St. Boston, 19 Pearl St., Chicago, 245 Lake St.,

Occupies this space every alternate week.

JOHN J. GRIFFIN & CO.,

1513-1515-1517-1519-1521 Race Street, Philadelphia.

52 Dey Street, New York. WM. S. GRIBBEL, Manager. | **75 N. Clinton St., Chicago.** FREDERICK WAUGH, Manager.

MANUFACTURERS OF

STATION METERS, CONSUMERS' METERS,

Provers, Registers, Gauges, Experimental Apparatus, Etc.

Prompt Attention Given to All Repairing.

OUR SPECIAL NATURAL GAS METER

Is the Best ever offered. Over 30,000 now in use.

We manufacture in the United States, under the **SAWER & PURVES PATENTS,** the

Positive Prepayment Meter.

. . SIMPLE . .

. DURABLE .

. ACCURATE .

. RELIABLE .

All Parts Interchangeable

This Meter is an unqualified success in Great Britain. Its simplicity of construction, and the positive character of the service performed by it, have given it pre-eminence.

Needs only the care given an ordinary Meter. Saves MONEY; TIME and CONSUMERS, Dispenses with "DEPOSITS" and increases OUTPUT.